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CONTENTS

■ Scientific Articles

THE FRACTURED MANDIBLE *G. Kenneth Lewis* 95

MAXILLOFACIAL PAINS SIMULATING TRIGEMINAL NEURALGIA *Casper M. Epsteen* 114

GENERAL ANESTHETIC METHODS WITH SPECIAL REFERENCE TO THIOPENTAL SODIUM *Edward C. Thompson and Herbert R. Sleeper* 121

RADIOLOGIC MANAGEMENT OF MALIGNANT ORAL LESIONS *H. F. Doane* 133

THE THIRD MOLAR PROBLEM *Spencer R. Atkinson* 136

PLASTIC SURGICAL CORRECTION OF ORAL DEFORMITIES *H. O. Barnes* 143

■ Case Reports

OSTEOMA OF THE MANDIBLE *Samuel A. Brandon* 153

AMELOBLASTOMA OF THE MANDIBLE *Glenn J. Pell* 155

ABERRANT MAXILLARY CUSPID WITH COMPLICATIONS *W. Aubrey Crich* 157

RADIATION NECROSIS OF THE MANDIBLE *Leonard Z. Lyon* 159

EDITORIALS 162

SURGICAL ORAL PATHOLOGY 165

QUERIES AND COMMENTS 174

BOOK REVIEWS 176

CURRENT LITERATURE 178

ANNOUNCEMENTS 181

VOLUME 8 • APRIL 1950 • NUMBER 2 JOURNAL OF ORAL SURGERY

The fractured mandible

■ *G. Kenneth Lewis, M.D., Chicago*

Fractures of the mandible are often seen by or referred to the oral surgeon, the general surgeon, or the orthopedic surgeon. As a result, it is necessary that these practitioners have a knowledge of the principles involved in the early care of such injuries. Intermediate or late care may be given by those versed in breaks occurring in the facial bones. The simpler types may be easily cared for, but the more complicated tax the imagination of the surgeon and will, of necessity, require special care to obtain the most pleasing results.

Principles of treatment are synonymous with those of fractures in other parts of the body. The primary objective is to obtain union of the fragments in good functional position, restore movement in the joints and power in the muscles in the least time. This is obtained through an early diagnosis based on history, physical examination and roentgenograms. The tendency to wait until edema has subsided may result in increased morbidity and possible mortality.

The anatomic structure of the mandible, as described by Gerrish,[1] is such that the posterior and lower borders of the mandible are superficial and easily palpated externally. In the mouth, the alveolus, teeth and the internal and external oblique ridges are obvious. The mandible is solid and, owing to its position, is subject to certain fractures.

The muscles of mastication are divided into three groups: elevators; depressors, and rotators. The elevator muscles are the temporal, the masseters and the internal pterygoids; the depressors are the mylohyoid, the geniohyoid and the anterior belly of the digastric; the rotators are the external pterygoids and the posterior fibers of the temporal. The elevators are extremely powerful, and displacement of the fragments occurs when a fracture is present. The internal pterygoid is more powerful than the masseter; the ramus is displaced inward. The depressor muscles originate at the lower border of the mandible near the symphysis, with the mylohyoids as an exception. The mylohyoids arise from the mylohoid ridge

Assistant Clinical Professor of Otolaryngology, University of Illinois College of Medicine, Chicago.

1. Gerrish, F. H. (ed.), *A Textbook of Anatomy*, ed. 2, Philadelphia and New York: Lea & Febiger, 1902.

and extend to the third molar region. They insert into the median raphe and hyoid bone (Fig. 1).

The mandible rotates around the condyles and is pulled forward on opening the mouth. The heads of the condyles are held in place by the capsular, the temporomandibular, the sphenomandibular and the stylomandibular ligaments. Posterior to the joint is the tympanic plate of temporal bone, which is thin; fracture here may result from a frontal blow.

The nerve supply to the mandibular area arises from the fifth and seventh cranial nerves.[2] The sensory nerve of the fifth cranial nerve supplies the middle and lower thirds of the face from the second and third divisions. With the geniohyoid as the exception, the nerves to the muscles of mastication are derived from the third division of the fifth cranial nerve, and those of expression are derived from the seventh cranial nerve.

Fractures may be divided into direct and indirect; the indirect fractures result from transmission of the blow to a weak place at a distant point; direct fractures occur at the point of trauma. Displacement of fragments may be due to the trauma or the muscle attachments. In order to obtain functional union, the fragments must approximate their original alignment. The depressors tend to displace the fragments downward or toward the hyoid bone; the rotators tend to displace inward and forward; fragments having two or more sets of muscles will be displaced in the direction of their resultant pull. The displacement of fragments should be reduced, correct alignment obtained as early as possible and complete immobilization insured to retain the fragments in correct position. One difference between fractures of the face as compared with fractures of other

2. Lewis, Warren S., *Anatomy of the Human Body*, ed. 20. Philadelphia and New York: Lea & Febiger, 1918.

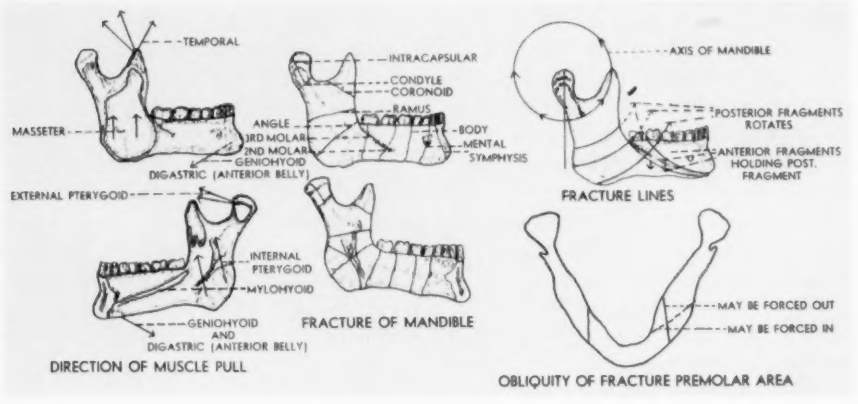

Fig. 1.—Direction of muscle pull, various fractures encountered in the mandible and importance of lines of fractures

Fig. 2.—Fracture of left condylar neck showing reduction with multiple loop, with maxillary elastic traction

bones is that the muscles do not tend to atrophy.

■ *Fractures of the Condyle*

The typical deformity of a fractured condyle is upward displacement of the ramus, with the body of the mandible pulled to the injured side, and with lateral displacement increased on opening the mouth. Unless the proximal fragment is displaced outward, displacement usually can not be demonstrated clinically, although the absence of the condyle in the glenoid cavity can occasionally be seen.

Displacement will vary from zero to the limits of the temporomandibular joint, and, if the capsule is ruptured, the head of the condyle may be forced out. In fractures of the condylar neck, there may be no displacement; forward displacements and outward displacements are rare.

Reduction and fixation of this fracture causes little concern as to the final action, because the condyle head in the joint cavity is not essential to efficient mastication (Fig. 2). Loss of function of the external pterygoid is compensated by the other muscles of mastication. The difficulty encountered in open reduction does not warrant opening of the joint.[3]

Whether the union is fibrous or bony is of lesser importance because treatment is directed toward muscle compensation.

Treatment is directed toward normal occlusion, with fixation maintained for a period of three to five weeks. Motion is started usually at the end of five or six days, and complete removal of fixation at four weeks. Displacement of the condyle affects function little, if at all.

In bilateral condylar fractures, a typical displacement occurs in the main body. The last molar teeth act as a fulcrum, producing an open bite anteriorly (Fig. 3). Union in this position presents a serious problem. Compound fractures of the neck of the condyle are rare, so early and rapid union may be anticipated. Reduction

3. Zemsky, J. L., New Conservative Treatment vs. Surgical Operation for Displaced Fractures at the Neck of the Mandibular Condyle. *D. Cosmos* **68**:43, 1926.

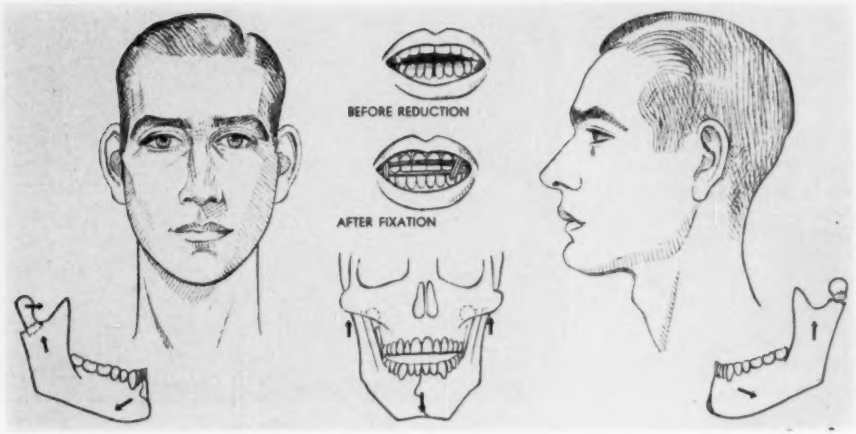

Fig. 3.—Double condylar fracture, showing open bite and displacement due to muscle pull

should be made early. Continuous observation is necessary to apprehend any displacement which may occur. The displacement, when found, is usually lateral. As soon as normal occlusion is effected, the traction is reduced to maintenance and close observation. When motion is allowed, which is usually at the end of seven to ten days, centric occlusion must be insisted upon without compromise. Open reduction in the uncomplicated fracture of the condyle is usually unwarranted.[4]

If the fracture is first seen after 14 to 21 days, bite blocks, as suggested by Ivy and Curtis,[5] may be used in the molar region. Anesthesia may be necessary in pulling the lower incisor region forward and up. If seen after 28 days, mechanical reduction is seldom if ever possible. Extraction of molars may relieve the condition, but excision of the condyle heads must be considered.

The injury to the temporomandibular joint at birth, from the use of forceps, may result in a crushing injury to one or both condyles.[6] The prognosis is guarded when this accident occurs, because bony ankylosis usually follows, necessitating single or double condylectomy (Fig. 4).

■ *Fractures of the Coronoid Process*

Fractures of the mandible in which the coronoid process is separated from the ramus are not frequent, and reduction is rarely indicated because, as a rule, there is little or no displacement (Fig. 5).

Diagnosis is made from roentgenograms, as there is no physical evidence of this fracture.

Treatment is immobilization for a

4. Ason, E. L., A New Operation for Displaced Fractures at the Neck of the Mandibular Condyle. *D. Cosmos* **68**:93, 1926.

5. Ivy, R. H., and Curtis, L., *Fractures of Jaws*, ed. 2. Philadelphia: Lea & Febiger, 1938.

6. Burket, L. W., Congenital Bony Temporomandibular Ankylosis and Facial Hemiatrophy; Review of the Literature and Report of a Case. *J.A.M.A.* **106**:1719 (May) 1936.

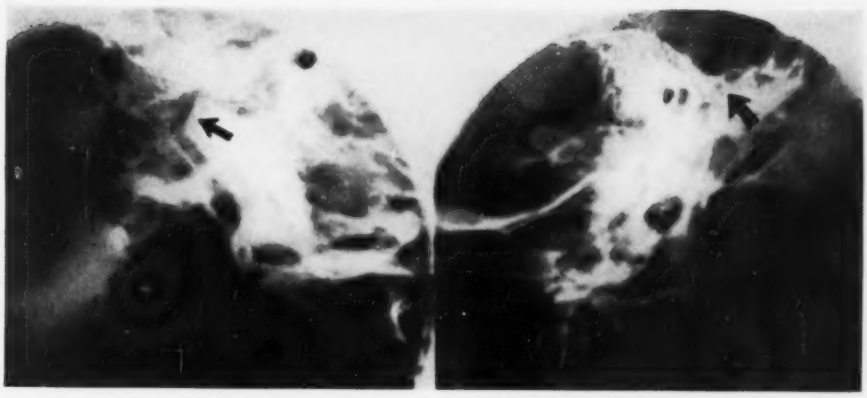

Fig. 4.—Crushing injury to temporomandibular joint at birth from forceps, resulting in ankylosis

period of two to three weeks, with teeth in occlusion. If the mandible is edentulous, fixation is usually not indicated. It is only in the compound fractures of the coronoid process that trouble may be anticipated (Fig. 6).

■ *Fractures at the Angle*

Fracture of the angle may result from direct violence, or indirectly from trauma at the opposite premolar region. The displacements encountered are due to the attachments of the elevator muscles pulling the posterior fragment forward, upward and inward. The internal pterygoid muscle is stronger than the masseter, which results in inward displacement. The fragment describes an arc around the temporomandibular joint if not resisted by the anterior fragment in the line of

Fig. 5.—Fracture of coronoid process; no physical evidence of this fracture, unless fracture is compound

fracture (see Fig. 1). The angle of the line of fracture may be such as to preclude inward displacement. Fracture at the angle may have a combination whereby it is prevented from inward displacement, but can be displaced forward and outward. In comminuted fractures, as found in gunshot wounds, the anterior fragment will have no control of the posterior fragment.

The forward and upward displacement will be limited by the teeth present in the posterior fragment, the maxilla and the upper buccal sulcus. The displacement of this fragment is important in outlining proper treatment (Fig. 7). Displacement of the anterior fragment is downward and rotated to the injured side.

Treatment demands a nicety of judgment, and consideration is given to the following: where function, union and appearance are not involved, reduction need not be attempted, but if function and prosthetic appliances are hazarded, reduction is necessary; when appearance is the only problem involved, it becomes a question of judgment as to reduction.

A very large number of fractures of the angle require only fixation of the anterior fragment in normal occlusion, using the soft tissues to hold the posterior fragment in alignment (Fig. 8).

If forward displacement results in pressure on the last upper molar, this tooth is left in place until union is complete, then extracted to relieve the irritation to the mucous membrane and painful bite.

Fig. 6.—Compound fracture of lateral wall of antrum and ramus of mandible, reduced by multiple loop, intermaxillary elastic traction

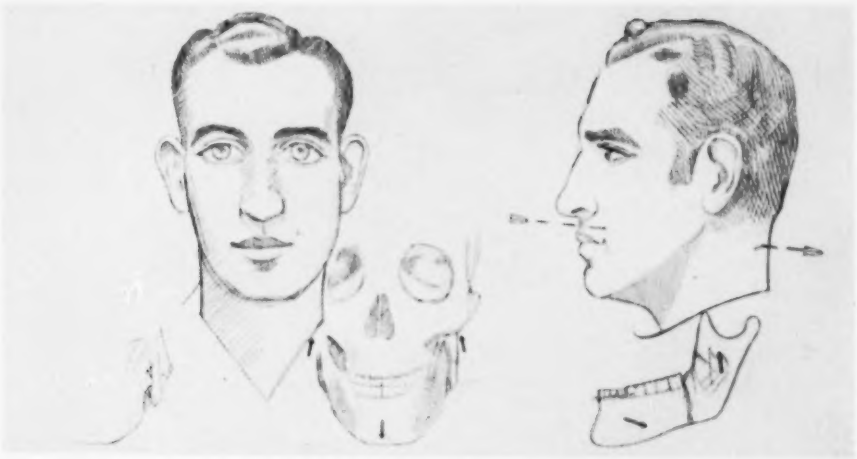

Fig. 7.–Compound comminuted fracture of angle with edentulous posterior fragment

If the molars are absent, a saddle extending from the anterior fragment may be used for control of the posterior fragment,[7] but not for reduction. Ivy[8] recommends the use of a block to reduce and hold the edentulous fragment. Lenormant and Darcissac[9] hold this fragment by the use of a wire attached to the posterior fragment and fixed to a plaster cap with a hook, as described by Scogin,[10] to form traction (Fig. 9). This method has the disadvantage of the head cap which rotates after a few days, releasing the tension and permitting the fragment to become displaced. This principle has been modified by Fry, Shepherd, McLeod and Parfitt.[11] They use metal cap splints, first described by Hullihen,[12] fastened to the anterior teeth, with an arm going around the face to the region of the posterior fragment and attached to the wire in the posterior fragment (Fig. 10). Impaction of the posterior fragment into the anterior fragment may be used in selected individuals.

Roger Anderson[13] pins may be used, as introduced to this field by Converse,[14] with the advantage of immediate mobility of the jaw. If fixation is for longer than a

7. Kazanjian, V. K., Treatment of the Injuries of the Upper Part of the Face, *J.A.D.A.* 14:1607 (Sept.) 1927.

8. Ivy, R. H., Practical Method of Fixation in Fractures of the Mandible. *Surg., Gynec. & Obst.* 34:670 (May) 1922.

9. Lenormant, C., and Darcissac, M., Le Procede des "Anses Metalliques Transosseuses" pour la Contention des Branches Montantes, dans les Fractures du Maxillaire Inferieur; son Application dans un Cas de Fracture Double Retrodentaire de la Machoire Inferieure. *Bull. et Mem. Soc. Nat. de Chir.* 53:503 (April) 1927.

10. Scogin, C. W., Construction Technic for an Orthopedic Headcap. *Internat. J. Orthodontia* 14:526, 1928.

11. Fry, W. Kelsey; Shepherd, P. Rae; McLeod, Alan C., and Parfitt, Gilbert J., *The Dental Treatment of Maxillofacial Injuries.* Oxford: Blackwell Scientific Publications, 1943.

12. Hullihen, S. P., Case of Elongation of the Under Jaw and Distortion of the Face and Neck, Caused by a Burn, Successfully Treated. *Am. J. D. Sc.* 9:157, 1849.

13. Anderson, Roger, An Ambulatory Method of Treating Fractures of the Shaft of the Femur. *Surg., Gynec. & Obst.* 62:865 (May) 1936.

14. Converse, J. M., and Waknitz, F. W., External Skeletal Fixation in Fractures of Mandibular Angle. *J. Bone & Joint Surg.* 24:154 (Jan.) 1942.

Fig. 8.—Fracture of molar region with edentulous posterior fragment on left held in place by the anterior fragment. On the right, a tooth in line of fracture is utilized to maintain position

few weeks, the pins tend to loosen, but this may be minimized by jaw fixation (Fig. 11).

■ *The Edentulous Mandible*

The patient, if edentulous, has no occlusion to lose. Therefore, reduction depends on three conditions: (1) is the fracture going to interfere with future prosthetics; (2) is a facial deformity to result; (3) will there be a delay in union. These are usually simple fractures, and union is generally rapid.

The principle of reduction is the same as that involved in fractures when teeth are present. Many of these fractures will unite in good position by simple bandage; however, all edentulous jaws cannot be treated in this fashion.

The Gunning[13] splint is a very useful instrument for fixation, or the patient's own dentures can be a very effective splint (Fig. 12); these may be used with circumferential wiring (Fig. 13).

■ *Fractures of the Molar Region*

Fractures in the molar region are not only influenced by the presence or absence of teeth on the posterior fragment, but also by the obliquity of the line of fracture (see Fig. 1). When this line runs from above down and back, displacement is more likely to occur than when the line of fracture runs from above down and forward. The elevator muscles are less able to displace the fragment in an upward direction if the fracture line is down and forward (see Fig. 1).

If a tooth is present, this will tend

13. Gunning, T. B., Treatment of Fracture of Lower Jaw by Interdental Splint. *New York M. J.* 3:433, 1866.

Fig. 9.—Posterior fragment controlled with plaster of paris head cap and wire hook extension to the angle of the jaw

to resist, and even prevent displacement. When the line is downward and back, with no teeth present, the posterior fragment is displaced upward by the elevators, and forward and inward by the rotators; the anterior fragment is depressed, and the midline of the mandible is diverted to the injured side (Fig. 14). It is for this reason the tooth in the posterior fragment is preserved, even though it may be in the line of fracture.[8] If bone loss is present, displacement forward is greater and advantage should be taken to facilitate union, being careful to prevent movement forward to the extent that contact is lost with the anterior fragment.

■ *Fractures of the Bicuspid Region*

If sufficient teeth are present in the mandible and maxilla, displacement is slight, owing to action of the teeth, but if teeth are scarce, and the injury severe, great deformity occurs, depending on the line of fracture. When the fracture is verticle, the posterior fragment is displaced upward, and the anterior fragment downward by the attached depressor muscles. The line of fracture is usually oblique; the fragments overlap, tending to accentuate the displacement, due to the action of the external pterygoids.

Fig. 10.—Hullihen's splint employed to control the posterior fragment

■ *Fractures of the Symphysis*

When no loss of bone is present, the muscle groups are balanced and no deformity results (Fig. 15), but if there is comminution, the two main fragments are inverted and drawn toward the midline (Fig. 16).

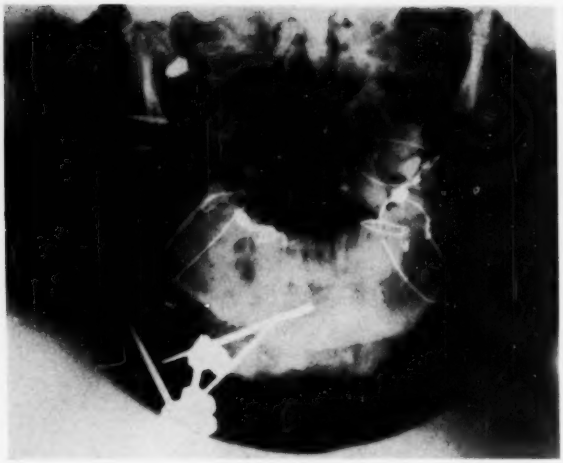

Fig. 11.—Roger Anderson external pin fixation, to control the posterior fragment

■ *Double Fractures of the Anterior Fragment*

If double fracture occurs in the bicuspid region, a typical deformity results. The middle fragment generally is displaced down and back, and the two side fragments upward and toward the midline. The amount of displacement depends upon the obliquity of the lines of fracture (Fig. 17). The backward displacement of the middle fragment may seriously interfere with respiration, and owing to the loss of control of the tongue, swallowing becomes difficult; the patient is unable to control saliva, with resultant drooling.

■ *Treatment*

Emergency care is rarely employed in mandibular fractures except when comminuted in the incisor region, or in a double fracture in the bicuspid region. The danger here lies in the tongue dropping back, interfering with respiration. For this reason the patient should lie on his face or sit bending forward until the tongue can be fixed in a forward position.

Hygiene of the mouth is the best

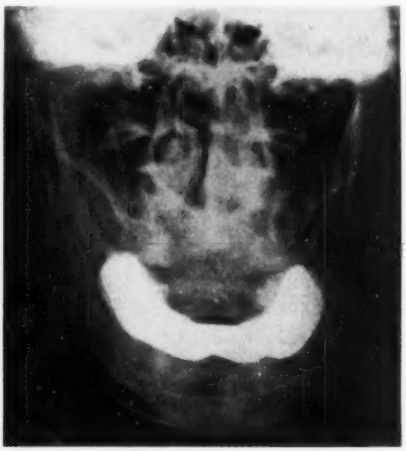

Fig. 12.—Fragment controlled in edentulous jaw by use of patient's dentures as a splint

control of sepsis; the use of some form of soap for washing the mouth and teeth is the simplest and most effective means. The patient should brush his teeth a minimum of seven or eight times daily with a soapy tooth paste. If a brush is too severe, the finger may be used. Mouthwashes are of little value in cleansing the mouth.

REMOVAL OF TEETH—All infected teeth require extraction, and even those in the line of fracture are controversial, because lines of fracture are pathways for spread of infective processes.[8] Teeth have been maintained, in this series of fractures, when it was felt they were useful for fixation. They were left in place until union was sufficient to hold the fragments; then extracted. If possible teeth should be retained for fixation of prosthetic appliances later. Close observation is essential so that any tooth producing an acute infection may be immediately removed.

DRAINAGE—In severe injuries, abscess formation often occurs, particularly in the region of the angle, and the establishment of submaxillary drainage is advisable. The drain is inserted in a dependent area and carried directly to the line of fracture, where it is left in place for a period of three to seven days.

FEEDING—It is essential that the patients receive sufficient calories to maintain their weight and physical activities. They should be able to assimilate anything eaten prior to the accident. Steaks may be ground in a food chopper and, using the fingers at first, the food may

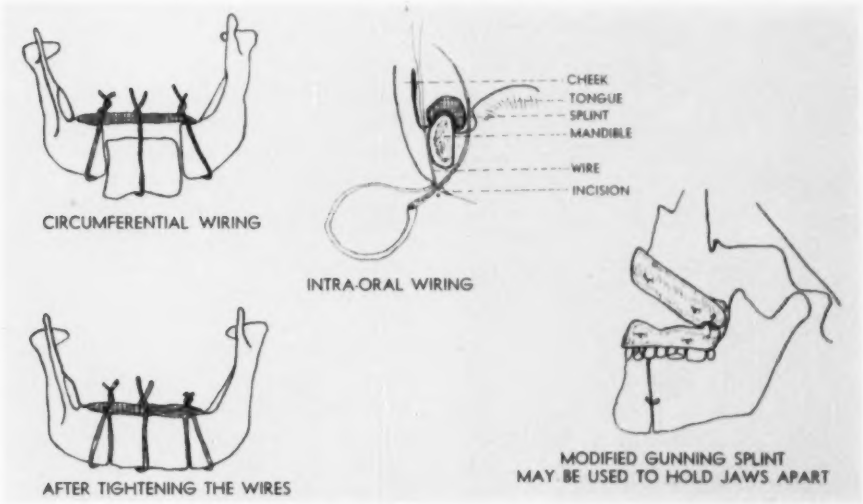

Fig. 13.—Circumferential wires applied to fragments for control by use of patient's dentures and a modified Gunning splint

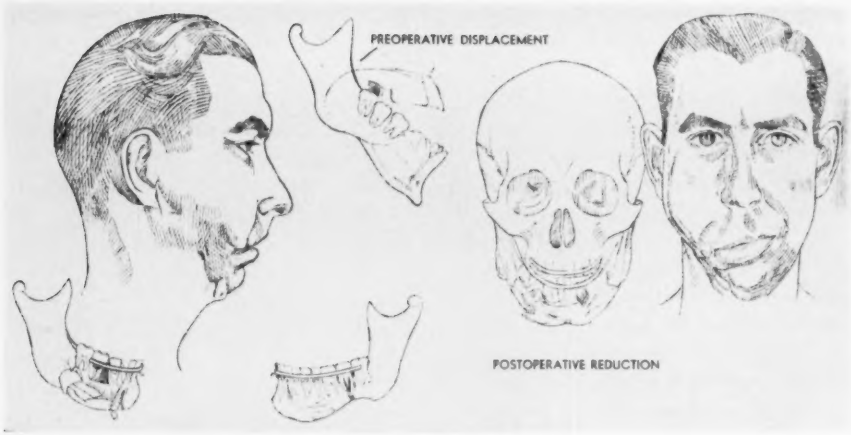

Fig. 14.—Buccal arch wires used to immobilize a comminuted mandible

be massaged between the teeth. Any other foods the patient may desire can be eaten in this manner. When one or more teeth are missing, the feeding is simplified. Patients cared for in an overseas hospital in World War II gained from 5 to 20 pounds during the period of fixation. A well balanced diet was given, and patients were encouraged to eat.

Fig. 15.—Fracture of symphysis, showing fragments held in place by muscle balance

SPEECH—With the teeth wired together, speech is a problem to most patients, but they are able to communicate with others within a period of a few days, with little or no trouble.

ANESTHESIA—Procaine hydrochloride block anesthesia was used in 513 patients of this series. The mandibular branch of the fifth nerve is infiltrated at the mandibular foramen. This type of anesthetic has been found sufficient for most types of fracture of the mandible. However, a general anesthetic was used in 34 patients for the placing of fixation, leaving the final application of traction until the patient was fully awake; many sur-

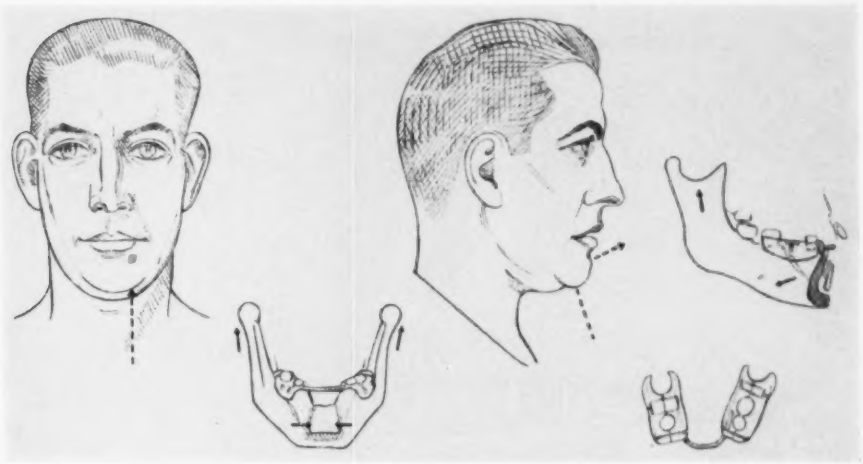

Fig. 16.—Fracture of the symphysis, showing immobilization with an acrylic splint

geons complete the fixation while the patient is asleep. The stomach must be empty before the anesthetic is started; if there is a question as to stomach contents, the stomach may be emptied with a stomach tube at this time. There will be suf-

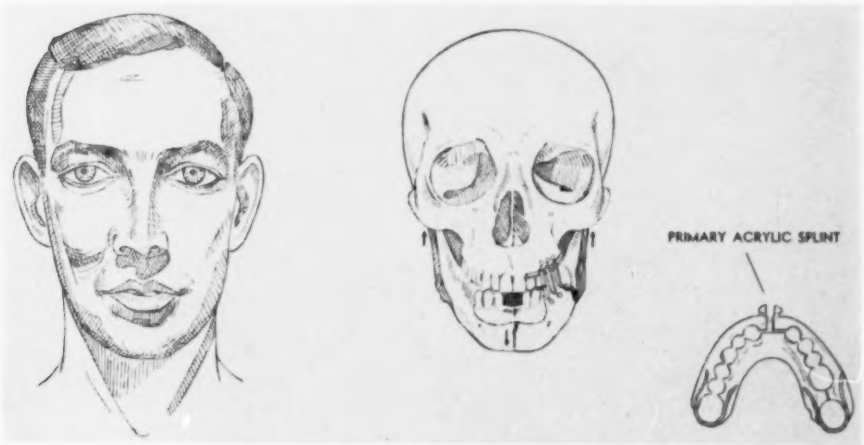

Fig. 17.—Compound complete fracture involving third molar area and symphysis; reduced with acrylic splint, buccal arch wires, continuous loops and elastic traction

Fig. 18.—Kirschner type wire, used for internal pin fixation

ficient room for liquid vomitus to be eliminated between the teeth. One disadvantage of a general anesthetic is the strain placed on the fixation and teeth during the waking period. At the time of operation, a string should be placed in the tongue to prevent its dropping back and closing off the glottis.

ROENTGEN EXAMINATION—The first roentgenograms are taken for confirmation of diagnosis, and the following observations are made:

1. Teeth in line of fracture.
2. Direction and amount of displacement.
3. Infected teeth.
4. Tumor of jaw.

Roentgenograms are repeated for:

1. Correction of displacement.
2. Progress of union.
3. Possible infection.

All fractures are studied by three extraoral plates: an anteroposterior and a lateral of each side. Dental films are used in the study of fractured teeth, alveolar fractures and detail of teeth in the line of fracture.

■ *Fixation of Fractures*

ALVEOLAR FRACTURES—If the fragment is not grossly displaced, and the blood supply not hazarded, reduction and fixation in its original position should be done. If the blood supply is questionable, extirpation is the procedure to follow. When the alveolar fragment has been removed, the mucous membrane should be sutured over the bone if possible, to hasten healing and wearing of dentures.

In fractures behind the last molar

tooth (Fig. 7), the main fragment is placed in normal occlusion and splinted to the maxilla, and the posterior fragment immobilized as indicated by the direction and position of the fracture.

If teeth are absent in the maxilla, the upper denture may be used to fix the lower jaw to the upper.

Comminuted fractures are cared for by immobilization of the main fragments in occlusion (Fig. 14), allowing the small fragments to align themselves in proper position. Drainage is a precautionary measure against bone loss.

In fractures with loss of substance the fragments are immobilized by approximation of the fragments if the loss is one-half inch or less; if over one-half inch, the fragments are immobilized in their occlusal position to await bone graft. This is an arbitrary measurement and it will be found that a nicety of judgment is necessary to determine which fractures can be cared for with or without bone graft.

Delayed union, according to Marsiglia,[16] is usually due to infection of the fragments, tumor, or insufficient immobilization. Removal of the cause and proper fixation usually result in union. Nonunion, according to Lacy,[17] is usually

16. Marsiglia, G., Le Secrezioni Interne e il Ritardo di Consolidazione delle Fratture. *Arch. Ital. de Chir.* 5:197 (April) 1922.

17. Lacey, J. T., Non-union of Fractures. *Ann. Surg.* 89:813 (June) 1929.

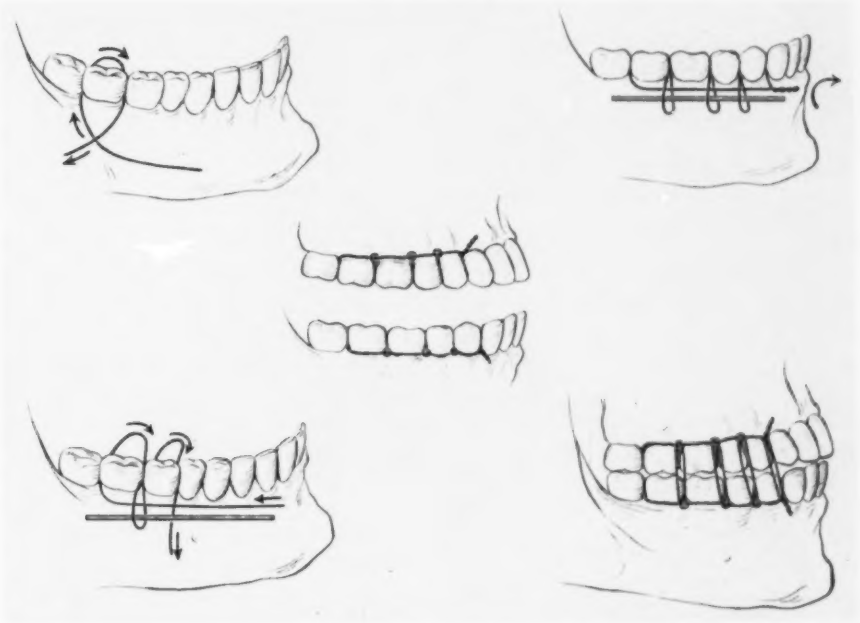

Fig. 19.—Intermaxillary multiple loop wiring. (Method devised by Colonel Roy Stout)

due to loss of substance or eburnation of the fractured ends. If due to the former, the fragments should be immobilized until infection has disappeared and the bone graft is inserted; if due to the latter, freshening the ends and proper immobilization is usually sufficient. Malunion may be cared for by grinding the teeth or extraction, with refracture indicated in gross deformity, and immobilization in normal occlusion.[18, 19, 20]

If the maxilla is not fractured, and teeth are present, it forms a most useful splint for fractures of the mandible. If teeth are present in the body of the mandible, these fractures are nearly all compound, the exception being a fracture through an edentulous area. Those posterior to the third molar teeth, as a rule, are simple fractures, with the exception of penetrating wounds.

The methods of fixation are legion, with many types of splints available; but, if teeth are present and the upper jaw intact, splints are unnecessary and are reserved for special fractures. When some teeth are absent and others unstable, arch

18. Padgett, E. C., *Surgical Disease of the Mouth and Jaws*. Philadelphia and London: W. B. Saunders, 1938.

19. Perthes, referred to by Limberg, A. A., A New Method of Plastic Lengthening of the Mandible in Unilateral Microgenia and Asymmetry of the Face. *J.A.D.A.* 15:851 (May) 1928.

20. Schloessman, referred to by Limberg, A. A., A New Method of Plastic Lengthening of the Mandible in Unilateral Microgenia and Asymmetry of the Face. *J.A.D.A.* 15:851 (May) 1928.

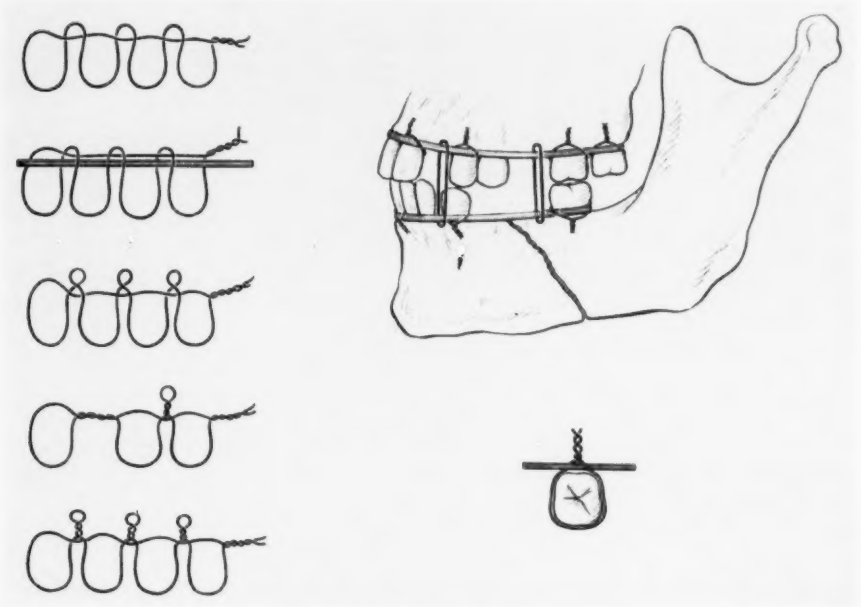

Fig. 20.—Winter's modification of buccal arch wires

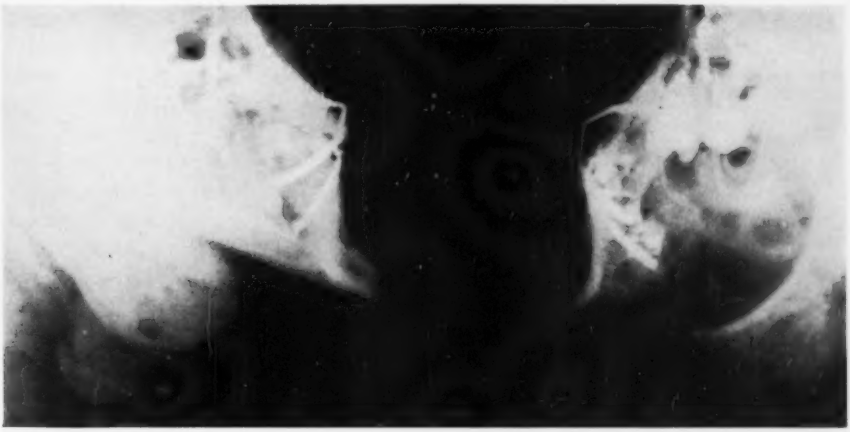

Fig. 21.—Loss of substance replaced by cancellous bone from ilium

bars[21,22] may be used to bridge these gaps to provide stabilization (Fig. 14).

In children, it is difficult to wire the teeth because of shape, and deciduous teeth do not withstand traction well; dental splints, which may be cemented to the teeth, are, therefore, indicated.

■ *External Fixation*

Many of the methods employing external fixation are based upon the Roger Anderson[13] pin unit principle. There are several modifications which have to do with the type of wire, screw, insertion and type of universal joint. In this series, the use of external fixation has been confined to edentulous posterior and displaced central fragments (Fig. 11). Complications have been rare and of such minor importance they were considered of no moment. The complications arising were loosening of the pin and a mild local cellulitis, each of which has cleared spontaneously on removal of the pins, requiring no treatment.

■ *Internal Pin Fixation*

The use of Kirschner type wire placed directly across the fracture line (Fig. 18), as introduced by Brown,[23] was used in eight patients and was discontinued because of difficulties encountered in placement. Pincock[24] devised a guide for insertion, but experience with this instrument is lacking.

■ *Cast Splints*

Fry, Shepherd, McLeod and Parfitt[11] have had extensive experience with cast

21. Sauer, C., Nothverband bei Kieferbruechen aus Eisendraht. *Deutsche Monatsche. f. Zahnh.* 7:381, 1889.

22. Gilmer, T. L., *Lectures on Oral Surgery*. Chicago: Northwestern University Dental School, 1903.

23. Brown, J. B., and McDowell, F., Internal Wire Fixation for Fractures of Jaw. *Surg., Gynec. & Obst.* 74:227 (Feb.) 1942.

24. Pincock, D. F., Horizontal Pin Fixation for Fractures of Mandible. *Surg., Gynec. & Obst.* 77:493 (Nov.) 1943.

Fig. 22.—Direct wiring of fragments of complete compound comminuted fracture of the mandible

splints (Fig. 10), which are described by Hullihen,[12] and the results have been most pleasing to the patient and surgeon. The disadvantages are the complexity of construction, application, necessary armamentarium and expense. It may be reserved for children, fractures posterior to the third molar, or for patients requiring fixation over a period of months.

■ *Multiple Loop Intermaxillary Elastic Traction*

This method of reduction has been used in 420 of the cases in this series (Fig. 19). It is easily modified to fit most situations, if teeth are present, and may be combined with buccal arch bars, introduced by Sauer[21] and Gilmer,[22] and modified by Winter[25] (Fig. 20), circumferential wiring, devised by Black[26] and various splints. The advantages of this method are: (1) simplicity; (2) ease of application; (3) cleanliness; (4) ease of alignment; (5) armamentarium and small cost.

■ *Acrylic Splints*

Certain conditions require more elaborate fixation than simple wiring and traction; acrylic splints are useful with extensive loss of bone, where the fragments must be held in their normal position until a bone graft is placed and consolidated (see Figs. 17 and 18). Function is maintained, which is often desirable. The advantages of acrylic over vulcanite and silver are: (1) it is inconspicuous; (2) observation of the gingival tissue can be made; (3) it is radiolucent.

■ *Loss of Substance Requiring Bone Graft*

Mowlem[27] found that the use of cancellous bone in wounds with bone loss obtained functional union in approximately five weeks' time. The bone graft could be placed much sooner than was possible when using cortical bone, and with greater ease. This work was reported later by Converse,[28] and Blocker and Weiss.[29] Five patients in this series received grafts of cancellous bone removed from the ilium. The bone was cut in chips about 1 cm. square and 1 mm. in thickness. For making the ridge, a longer piece was used to bridge the gap and then

25. Winter, L., Fractures of the Mandible. *D. Cosmos* 76:316, 1934.

26. Black, G. V., quoted by Gilmer, T. L., *Lectures on Oral Surgery*. Chicago: Northwestern University Dental School, 1903.

27. Mowlem, Ransford, Bone and Cartilage Transplants, Their Use and Behaviour. *Brit. J. Surg.* 29:182 (Oct.) 1941.

28. Converse, J. M., Early and Late Treatment of Gunshot Wounds of the Jaws in French Battle Casualties in North Africa and Italy. *J.O.S.* 3:112 (April) 1945.

29. Blocker, T. G., Jr., and Weiss, L. R., The Use of Cancellous Bone in the Repair of Defects about the Jaws. *Ann. Surg.* 123:622 (April) 1946.

the chips were packed about the area to make the desired filling. There were no failures, and union was sufficient to permit use of the mandible in a period of six weeks (Fig. 21). The graft was placed, in each instance, as soon as healing was complete, which was three weeks, five weeks, four weeks, six weeks and two months. Stabilization of the mandible was external fixation and multiple loop intermaxillary wiring.

■ *Direct Wiring*

Direct wiring of fragments was performed in one patient, the attempt being to preserve the several fragments of a comminuted body angle and ramus (Fig. 22). The operation was performed two hours after injury. Difficulty was encountered in holding the fragments by the usual methods. The result in this one patient was pleasing, but direct wiring should be limited to selected patients, because practically all mandibular fractures are compound. Direct wiring adds a foreign body and tends to set up a chronic inflammatory process, or abnormal callus formation.

■ *Length of Fixation*

Thirty-five days is the average time limit for fixation of the uncomplicated fracture. This time limit has varied considerably in various patients. Younger individuals were usually held in fixation a shorter period of time than older ones. The basis of removal of fixation has been sufficient callus to maintain position when, grasping the symphysis and angle, spring in the fracture is absent; also when function produces no noticeable movement by the patient. Roentgenograms have been of little or no help in determining union, clinical union being present before it is demonstrable in the roentgenogram. The period of fixation in uncomplicated fractures varied from 27 days to 49 days respectively.

Those complicated by comminution, without infection and loss of substance, required approximately the same period of fixation; the same was true of bilateral fractures and multiple fractures.

Those with infection varied; 45 days was the shortest and 93 days the longest period of fixation.

Limitation of motion on removal of fixation in uncomplicated fractures has been of only passing concern and usually disappears within 7 to 10 days on normal use of the mandible; mechanical pulls were used on none of this series. On resumption of chewing, talking and exercise, normal function was rapid, except in extensive gunshot injuries in the region of the ramus. In such cases limitation of motion may result from formation of cicatrices but true joint ankylosis is rare. According to Imbert and Real[30] it is a muscular contraction produced the instant the wound is received and may follow an insignificant insult to the tissues. The condition, if due to scar band, is permanent or remains until relieved by transplanting a flap or skin graft to the scarred area. In true ankylosis, a condylectomy must be considered on one or both temporomandibular joints.

■ *Summary*

A description of fractures of the mandible, cared for in civilian and military

30. Imbert L., and Real P., *Rev. Neurol.* (Paris) 23:942, 1916.

practice, is presented, with a review of the literature.

The displacements of fragments in the various fractures encountered in this series, from the condyles to the symphysis, including those of the edentulous mandible and the complications arising in this type of injury, are discussed.

Treatment, emergency care and the procedures employed in repair of these fractures are described in detail. The length of fixation in complicated and uncomplicated fractures of the mandible has been differentiated, and the variance of the time limit for fixation has been pointed out, with an arbitrary time of 35 days as an average in the uncomplicated fracture.

Each procedure used in this group of cases has been found of valuable merit, but experience and the results obtained with the various types of fixation and methods used in reduction have found the use of any one method impractical. The use of a combination of methods for each individual case may be indicated to obtain the most satisfactory results.

Maxillofacial pains simulating trigeminal neuralgia

■ *Casper M. Epsteen, M.D., D.D.S., Chicago*

Some of the neuritic disturbances around the face and mouth are so severe that they might easily be confused with trigeminal neuralgia major.

An attack of true trigeminal neuralgia produces a picture of pain which, when once seen, is seldom forgotten and leaves no doubt as to the diagnosis. Pathologically, tic douloureux is not well understood. There is much to support the opinion, however, that this disease is often caused by a local vascular sclerosis in which the arterial spasm may act as the inciting factor of the paroxysm. It is also known that the affliction is central in origin and in some cases syphilis of the gasserian ganglion has been demonstrated. This does not mean that all cases of epileptiform neuralgia are associated with syphilis. In that group of conditions identified as intrinsic or minor neuralgias, there is definite inflammation involving the actual nerve trunks or their sheaths. Visceral referred pains arise from nerve end irritations in the mouth, teeth, gingivae, lips and tongue.

Neuralgia means nerve pain and neuritis means inflammation of a nerve. Both these conditions are painful, yet each has

From the department of Maxillofacial Surgery, Michael Reese Hospital and Cook County Hospital, Chicago.

its characteristic features. In neuralgia, pain is the only symptom—it is intermittent, paroxysmal, sharp, shooting and lightning-like in character; of short duration and directed along the course of a nerve trunk. The pain of neuritis, however, is very often continuous, but varies in degree of intensity and may even subside for hours at a time. However, in the height of its severity, it may become neuralgia-like in character. Generally this pain is diffuse and deeply seated, and of a dull and aching nature, sometimes described as a sense of soreness throughout the part involved.

The clinical manifestations of tic douloureux involve only the sensation of pain. Characteristically absent are such sensations as numbness and tingling. Quite frequently the pain is so severe that it may stun the individual at the moment of the attack. All movements or thoughts seem to stop abruptly during a paroxysm. The facial muscles of expression are definitely set in painful distortion, the eyes become fixed, speech is arrested and often it seems difficult to breathe. The pain disappears as suddenly as it starts, rarely lasting more than half a minute. The attacks of pain are seasonal and appear more frequently during a sudden change of weather. The paroxysms usually occur during the day and seldom at night. This does not mean that a severe attack of pain cannot and does not occur during the night. It may be so extreme as to arouse the afflicted individual from a deep sleep. This is the exception to the rule but, if such a history is given by the patient, a greater degree of care and skill is required for a correct diagnosis. As a rule, elderly people from the fourth decade onwards are affected more commonly, and women seem to be more subject to this disease than men. In the majority of cases, the attacks begin in either the second or third division, rarely, if ever, in the first. In a true case of tic douloureux, trigger zones may be definitely pointed out along the nerve involved, but the patient never touches his face with his finger for fear of inciting an attack. The slightest pressure on the face in one of these zones will produce a spasm of pain that may spread throughout all the parts involved. Talking, eating, washing the face, or shaving are great ordeals because these acts might produce a spasm. Fortunately, remissions have occurred and the pain stops quite as suddenly as it appears. It is an indisputable factor, incomprehensible as it may seem, that addiction to drugs and trigeminal neuralgia seldom go together. The short duration of pain, its paroxysmal nature, complete relief between attacks and the sudden cessation of the attack are the distinguishing characteristics of this disease.

In most cases of trigeminal neuralgia it seems that the correct diagnosis of the maxillofacial pain is not made until after the teeth have been extracted, the nasal accessory sinuses operated upon and treatment directed towards the temporomandibular joint, either in a conservative manner or perhaps surgical. More mistakes in diagnosis are made because of lack of thoroughness, rather than lack of knowledge.

In acute dental diseases, the pain is very sharp and severe in character and may be transmitted along the jaw involved, but it is not paroxysmal, its duration may be hours or until relief is obtained, the cessation of the attack is

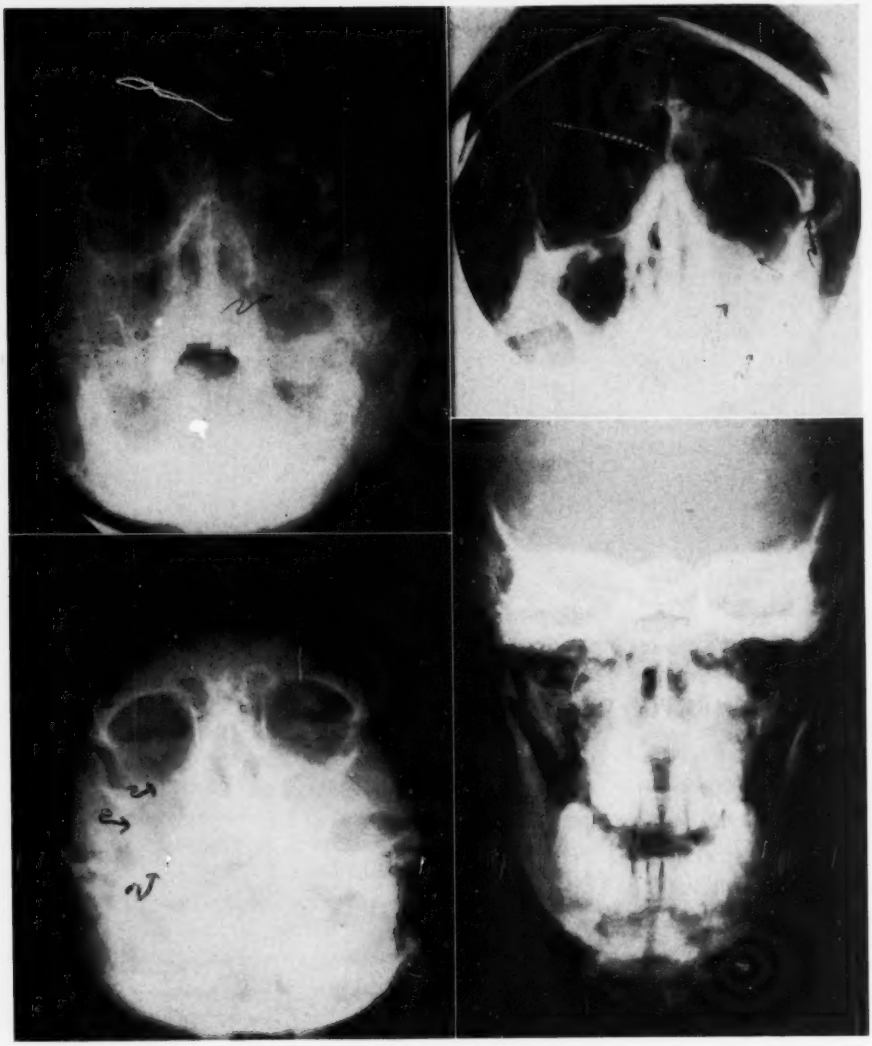

Fig. 1.—Multiple fractures of the facial bones of the middle and upper third, with the possible involvement of the first and second branches of the trigeminal nerve

gradual and the proper treatment precludes another attack caused by the particular offending organ.

It is not uncommon for gingival recession to expose a dentin that is extremely sensitive to thermal changes. Although the pain is short in duration, the severity is not so great, the anatomic distribution is not so definite and the etiology is demonstrable.

Unerupted, malposed or supernumerary teeth may produce pain similar to trigeminal neuralgia. The onset of these attacks of pain is variable, the character is more of a soreness, rather than shooting, stabbing and paroxysmal in nature. There is not a sudden cessation of pain, and removal of the tooth or teeth produces a cure.

Acute diseases of the ear often produce pains which tax the diagnostic abilities of the best to distinguish from tic douloureux. At the onset the findings may be very indefinite and the pain referred along one or more branches of the trigeminal nerve. There is a rise in temperature, absence of trigger zones and usually a suggestive history of the etiology, such as upper respiratory disease or foreign body in the ear. The pain is not paroxysmal in character, the duration is longer and in a comparatively short time it becomes localized to the aural region.

Crushing injuries to the upper jaws with compression of the infraorbital nerve, and fractures of lower jaws with involvement of the mandibular nerve, may produce severe lancinating pains. However, the history of trauma together with the absence of other diagnostic characteristics of tic douloureux precludes a mistaken diagnosis (Fig. 1).

A fracture of the lower jaw which had healed in poor position with impingement of the mandibular nerve produced a condition so similar to the pains of trigeminal neuralgia that the teeth had all been removed and the various sinuses had been operated upon without avail. Alcoholic injections produced temporary relief. Permanent relief was obtained only when the mandibular nerve was freed from its impinging vice (Fig. 2).

Although arthritis of the temporomandibular joint at times produces neuralgic pains of a tic character, the duration of the attacks of pain and the pain in the ear on opening and closing the mouth together with positive roentgenographic findings are usually sufficient to make a differential diagnosis.

Acute paranasal sinus infections produce pain referable to the region involved; for example, maxillary sinus pain is much more superficial than the deep-seated pain of ethmoid and sphenoid sinus infections. Very often the pain follows the course of the trigeminal nerve but it differs greatly in character. It is not the severe, sharp, lancinating pain of tic that comes on very suddenly and without warning, lasts 15 to 45 seconds and then disappears. Sinus pain is not so sharp and severe, comes on with an acute attack of sinusitis and lasts for several hours or days. It is relieved only with a subsiding of the disease within the sinus. The pain is often influenced by posture. That of maxillary sinusitis usually is better when the patient lies down; the reverse is true of the frontal sinusitis. The tenderness, nasal discharge, headache, general febrile symptoms and conditions within the nose, together with roentgenograms and transillumination are

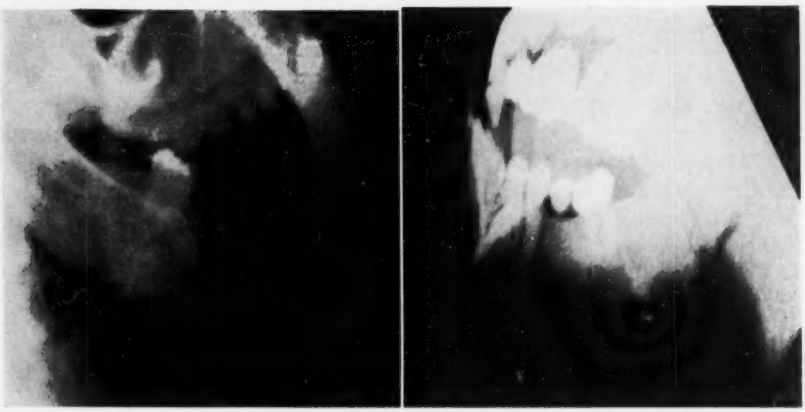

Fig. 2.—Overriding fractures of the mandible with impingement of the mandibular nerve

paramount factors in making the diagnosis (Fig. 3).

Many cases of neuralgia following acute facial herpes resemble tic douloureux in the severity and lancinating character of the pain, but these excruciating pains are superimposed upon a more or less constant burning sensation. Postherpetic pains often occur for weeks following the disappearance of the cutaneous lesions and sometimes they may occur during the remainder of the patient's life, especially when the acute attack has its beginning in patients past middle age. Postherpetic neuralgia clears up in several weeks in young individuals, but in adults it may last months or years with remissions. The pains, as a rule, are limited to the branches involved and are more or less continuous, yet they may come on spasmodically. The history and examination which may show the scars of vesicles, together with hypesthesia of the skin, are important diagnostic factors. This disease is usually self limited. Of particular importance is the fact that the pain is not affected by alcohol injections or resection of the posterior root.

One of the most confusing types of head or facial pain is migraine which produces pain through the eyeballs or cheeks. Trigeminal neuralgia is not associated with headache, and a careful history is often sufficient to distinguish the migraine pain from true neuralgia.

Cranial tumors, especially those involving the gasserian ganglion, produce facial pains which, in themselves, are often difficult to distinguish from tic douloureux. With the signs and symptoms of intracranial pressure, namely, increased quantity of spinal fluid, swelling of optic disks, or choked disks, headache, vomiting, vertigo, convulsions, mental symptoms and decreased pulse and respirations, the fact that sensation in the region distributed by one or more of the trifacial branches is lost, the presence of relative hypesthesia

in the trigeminal region and later the sensory and motor paralysis still usually differentiate major tic from neoplasms.

Malignant tumors, especially those arising from the nasal pharynx, may extend to involve one of the divisions of the trigeminal nerve and may give rise to a type of pain closely simulating that of trifacial neuralgia (Fig. 4). Usually there is associated the deep boring type of pain as well as symptoms referred to the ear on the same side as the pain, such as noises in the ear, soreness and loss of hearing. The nasopharynx should be routinely examined in these cases to rule out such possibilities.

Malignant tumors of the face and mouth produce pains which vary in distribution with the site of the lesion. These pains, however, are of such a nature that they should not be confused with the pains of tic douloureux.

Sphenopalatine or Sluder's neuralgia is usually caused by some infectious process of the sphenopalatine ganglion and is relatively rare. The pain is more constant and is usually present at the base of the nose, around the upper jaw and

Fig. 3.—Bilateral maxillary sinusitis with unilateral polyposis

Fig. 4.—Carcinoma of the mandible secondary to parapharyngeal cancer

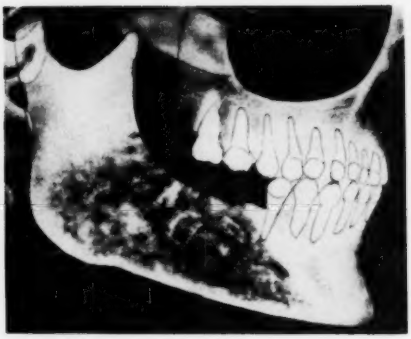

Fig. 5.—Destructive osteomyelitis of the mandible. This type of pathologic condition may well produce severe pains in the lower jaw

eyes, radiating backward to the ear and mastoid region and sometimes extending down the neck. Cocainization of the sphenopalatine ganglion affords temporary relief. Alcoholic injections into the ganglion usually produce favorable results.

Glossopharyngeal neuralgia is similar to tic douloureux in that both conditions are intermittent. The pain of glossopharyngeal neuralgia may be provoked by yawning, swallowing (especially cold liquids), or talking, and usually radiates into the tympanic membranes. To differentiate this condition from major tic, cocainization of the tonsillar fossa, which is the trigger zone of glossopharyngeal neuralgia, serves as a very important means of diagnosis, because glossopharyngeal neuralgia is thus immediately relieved, whereas, the pain of trifacial neuralgia is not affected.

Intense pain is nearly always produced in the early stages of acute osteomyelitis of the lower jaws. The pain is of a severe lancinating type, referred along the course of the mandibular or infraorbital nerve, more or less constant and associated with extreme tenderness and swelling of the jaws. There is also a history which, as a rule, reveals the predisposing cause, such as trauma following extraction of teeth (Fig. 5).

After difficult extractions, patients often experience severe pains in the jaws and face. These pains may be due to surgical trauma or postoperative osteitis, commonly referred to as "dry socket," which is a bad misnomer. The pain is severe, sharp and constant, being relieved only by medication and then only for the duration of the effect of the drug. The patient has difficulty sleeping and presents a haggard and tired appearance and is willing and eager to try anything for relief. In one case 1¼ grains of morphine sulfate had been given in five hypodermic doses, together with various other analgesias and sedatives, during a twelve-hour period, without any relief. As a rule, with the propert treatment, this pain lasts from three days to three weeks, but can be kept under control so that the patient is comfortable.

■ *Summary*

The dread and fear in which tic douloureux is held by the patient and physician warrant a brief discussion regarding its differential diagnosis. Resection of the sensory root of the gasserian ganglion gives excellent results with a very low mortality when handled competently. Yet it would be tragic if such an operation were performed, successful as it may be, with an incorrect diagnosis.

Not all maxillofacial pains are tri-

geminal neuralgia and, therefore, much care and patience must be exercised in arriving at a correct diagnosis in order that proper treatment may be instituted and relief obtained. Although this is universally true in medicine and all its branches, nowhere is a patient more grateful for relief. With this in mind, a few of the more important conditions simulating trigeminal neuralgia are discussed.

General anesthetic methods with special reference to thiopental sodium

■ *Edward C. Thompson, D.D.S., and Herbert R. Sleeper, D.D.S., Urbana, Ill.*

Fear plays an important part in dentistry; it exists in the minds of countless patients and dentists. Dentists fear the use of general anesthetics in their offices because of serious and frightening episodes of near death, and hundreds have abandoned its use.

The object of this paper is to point the way toward developing practical technics for anesthesia in those dental offices where it is physically possible to do so properly. Adequate space for safe operation and recovery is necessary. Also, there should be complete and properly functioning equipment such as is rarely found even in most hospital operating rooms. At least two trained persons, in addition to the dentist, are strictly necessary. It is extremely dangerous and unsatisfactory to attempt the use of general anesthesia without a comprehensive period of study and observation of proper technics. Furthermore, the dentist should not fully depend on the knowledge of a physician or nurse anesthetist. It is necessary that he be able to manage any problems of resuscitation, for in case of death or serious accident he will receive the central attention. Anesthesia for oral surgery is a special field which is little understood by most otherwise competent anesthetists. The practice of calling in a congenial physician from a neighboring office to administer thiopental sodium is fraught with great danger. Having gained sufficient grounding in the essential technics, the dentist should train his own personnel to handle his general anesthesia problems.

There is no ideal anesthetic; in fact, there is no anesthetic that can be utilized very well without synergists if the best results are to be attained in difficult cases. However, a good working knowledge of

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the use of nitrous oxide should be a prerequisite to employment of the others. Proper administration of nitrous oxide is not easy and, because of the lack of knowledge and practice necessary to its use, many have indiscriminately used thiopental sodium. Deaths have occurred in practically every section of the country, giving undeserved criticism to this very useful drug.

■ *Major Considerations in the Use of Nitrous Oxide*

The range of utility of nitrous oxide is wide because of its special virtues, safety, rapid action and remarkable recovery. The primary factors to be considered before electing to use it are: the status of the patient; the complexity of the operation; the capabilities of the anesthetist and the operator. Attention should be given to proper scheduling of the cases. There should be explicit preoperative instructions.

A physical examination of the patient is not necessary in the majority of instances. Only when there are obvious doubts as to health, and if there are possible medicolegal aspects to the case at hand is there need for medical advice. If physical examination is necessary, it should be done by someone familiar with oral surgery and should be thorough. If there is a question of cardiovascular disease an electrocardiogram and a chest plate should be included. Adequate information to permit safe use of an anesthetic can generally be obtained by scanning the patient and asking a few discreet questions. If a patient can walk unaided into the office and is able to carry on his routine daily life habits he evidently is a suitable risk for a short nitrous oxide anesthetic.[1] Questions as to previous anesthetic experience will sometimes elicit a story of violence and failure. The majority of these patients are robust or alcoholic. Observations of the patient regarding his vitality, color, obesity, muscles, neck size and tissues of the air passages can be supplemented by questions concerning rapid breathing upon mild exertion, or pain about the chest, scapula or left arm. It should also be determined if there is persistent swelling of the ankles, wheezing, or if the patient commonly sleeps on more than one pillow. Moderate obesity does not create a problem. Extreme obesity makes anesthesia difficult because the excess tissue about the neck and floor of the mouth causes airway impairment when the mouth is wide open. If carefully given, nitrous oxide is relatively safe in the presence of organic heart lesions, unless considerable decompensation exists. However, the psychic state of the patient, severity of the operation and difficulty or lack of difficulty in maintaining respiration have more to do with the danger factors than the anesthetic agent employed. The presence of ankle edema or dyspnea on exertion is always a danger signal calling for further investigation. Pain starting in the heart and radiating down the left arm is a definite warning of cardiac disturbance and indicates a need for caution. Difficult breathing in the recumbent position indicates respiratory inadequacy. A possibility of a vascular accident in the hypertensive patient must be anticipated.

1. McCarthy, K. C., Safety of Nitrous Oxide-Oxygen Anesthesia in Dentistry. *J.A.D.A.* 26:197 (Feb.) 1939.

PREMEDICATION — Premedication should be given except in short simple cases. With its aid, the metabolic rate is decreased, the patient is more calm and requires less of the anesthetic. Pentobarbital calcium, 1½ to 3 grains (0.09 to 0.18 Gm.), given one-half to one hour preoperatively, is excellent. Morphine, 1/6 to 1/4 grain (0.01 to 0.015 Gm.), may also be used, alone or in combination with 1/150 grain atropine (0.0004 Gm.). All three drugs may be combined for effective control of a very active patient. They may be given intravenously, just before or during anesthesia when required, if injected slowly and with care as to individual requirements. It should, however, be realized that these drugs mask the warning signs of anesthetic depth.[2] A further objection to morphine is that it is often responsible for prolonged nausea and depressed respiration.

AIRWAY MAINTENANCE—The airway problem is the most difficult and most important item in general anesthesia; yet many anesthetists and surgeons fail to select suitable mouth props, fail to devote constant attention to the position of the tongue and fail to keep the lower jaw adequately supported to provide airway.[3] The entire operating team must be alert to assist in airway maintenance.

TECHNIC OF ADMINISTRATION—1. Ask the patient to stretch the mouth open very wide and insert a suitable prop. No one style is sufficient, but McKesson's has great utility.

2. Start a slight flow of nitrous oxide in the nasal inhaler and apply it to the nose. After a few breaths, apply the mouth cover.

3. When the patient begins to lose consciousness, apply restraints. Place them so that they may be used if the patient becomes excited.

4. When inspiration and expiration become balanced and the eyeballs become fixed, uncover the mouth and apply the barricade pack properly. Oxygen want, as evidenced by increase in respiratory rate, is corrected by increasing the oxygen percentage, slowly at first to slow up the respirations, then adding the required maintenance dose. Use additional gauze packs to supplement the barricade pack and discard them for dry ones as they become saturated with blood and saliva. Prevent air leaks. Keep working on the airway problem. Avoid bending the neck too far forward or backward. Elevate the mandible if breathing seems obstructed. Use a nasopharyngeal tube if needed. Intratracheal intubation is not practicable in the office, as this technic requires deep ether anesthesia with intercostal breathing for insertion of the tubes and recovery is too prolonged.

5. Keep the patient pink. Only a short period of cyanosis is permissible. If the patient cannot be controlled on nitrous oxide and oxygen, promptly add vinyl ether. When this drug is added, adjust the mixing valve to supply 20 per cent oxygen before starting the flow of gases through the vinyl ether jar. Use about one fourth of the delivery capacity of the vinyl ether attachment on your machine and vary according to need.

2. Allen, C. R.; Echols, R. S.; Hoeflich, E. A.; O'Neal, K. C., and Slocum, H. C., Variations in the Signs of Acute Oxygen-Want During Anesthesia. *Anesthesiology* 8:601 (Nov.) 1947.

3. Christiansen, G. W., A Technic for General Anesthesia in Surgery of the Mouth. *J.A.D.A.* 27:1575 (Oct.) 1940.

6. Do not let the patient become "too light." Vomiting, or other interference may ensue.

7. Add very short bursts of oxygen from the emergency line when anesthesia seems too deep. Do this frequently, as it is impossible to absolutely control the gas oxygen percentage within the anesthesia circuit with the mixing valves. Shallow or irregular respiration means depression of the respiratory centers and more oxygen is needed. Re-breathing is advisable in the longer cases, as the collected carbon dioxide stimulates respiration and saves gas.

SIGNS OF ANESTHESIA—Respiratory—During induction the respirations are prolonged because of the body effort to overcome oxygen want. This is followed by a slight acceleration of the respiratory rate, caused by an accumulation of carbon dioxide in the lung alveoli. The respiratory center is thus stimulated, and the hyperpnea thus induced washes out the carbon dioxide and equilibrium is restored. Balanced respiration indicates the inception of the working stage. Too deep anesthesia is indicated by exaggerated, irregular breathing—the expirations being longer than the inspirations. If expirations become jerky and spasmodic, force oxygen promptly, as the patient is in danger.

Color—Cyanosis except for short periods is to be avoided. There is a great deal of argument about its significance, but it certainly seems prudent to avoid it.

Muscular — Protective, purposeful movements indicate light anesthesia, while purposeless, clonic, muscular movements indicate great depth. Study of the muscular signs will aid materially in learning the control of proper depth of anesthesia.

Eye signs are of some corroboratory significance in judging anesthetic depth, but they are often confusing.

An active lid reflex and rolling eyeball indicate light anesthesia, while a sluggish lid and a fixed eyeball are signs of good working depth. The pupil of the eye dilates during a state of stimulation of the sympathetic nervous system, as during the excitement of induction. It contracts when the central nervous system is stimulated. When the sympathetic nervous system is paralyzed, the pupil contracts because the sphincter muscles are allowed to contract; when the central nervous system is paralyzed, as by overdosage, the pupils dilate because the sphincter muscles relax. A dilated pupil, accompanied by ashen gray color, means central nervous system failure.[4]

Pulse Signs—During induction, a rapid, full pulse is present. In the working stage it drops to normal. When the working stage is carried lower into deep anesthesia there is an increase in pulse rate, followed by the slow bounding pulse of oxygen want. Heart failure is often marked by irregularity of the pulse. A rapidly rising pulse rate at this stage calls for forced oxygen. A burst of oxygen on the emergency valve should be supplied immediately and the mixing valve adjusted.

The dentist's fear of nitrous oxide technic arises from failure to thoughtfully prepare himself for its use. Christiansen[3] said, "no mystery should surround it."

4. Seldin, H. M., *Practical Anesthesia for Dental and Oral Surgery*, ed. 3. Philadelphia: Lea & Febiger, 1947, pp. 381-384.

Examinations and good judgment dictate the course of anesthesia. However, nitrous oxide has its limitations. It is no disgrace to employ synergists when necessary. We wish to re-emphasize that vinyl ether is valuable for this purpose, and individualized premedication is an important adjunct. Intravenous administration of these premedicants is perfectly feasible for office practice, but the dangers of overpremedication in an effort to employ smaller concentrations of anesthetic agents should be stressed. Allen, and others,[2] upon reviewing the various reports on death during nitrous oxide anesthesia, noted that the patients had usually received heavy premedication with barbiturates, morphine and atropine. The fact that these reports were made by anesthetists with much experience emphasized the fact that death from asphyxia can occur under such circumstances without distress signals, such as a slow bounding pulse or a period of asphyxial gasping.

■ *The Use of Thiopental Sodium*

A comprehensive view of practice today emphasizes the fact that there are branches of the work which have not been mastered—and yet, their virtues cannot be denied. While attempting to master the use of thiopental sodium (Sodium Pentothal), the philosophy of "nothing attempted, nothing gained" should be applied with caution.[3] The need for mastering nitrous oxide-oxygen technic before undertaking thiopental administration has been stressed, and at least 500 operations under nitrous oxide-oxygen, and vinyl ether or ether combinations should be performed before trying thiopental sodium. Normal patients with simple conditions should be chosen until practice has brought assurance and knowledge as to how to meet the various problems which arise.

Krogh[3] has outlined a method of study for "those who are trained in the use of general anesthesia." He stated that observation is not enough, and that intensive study is essential. In untrained hands, thiopental sodium is a very dangerous agent. The training necessary to its proper use cannot be obtained except under direction of competent dental surgeons. Only a very few physician anesthetists have the skill to administer it safely for oral operations. Those who do have one common virtue: they are adept at using the laryngoscope. Thiopental sodium should not be given unless either the anesthetist or the operator is competent to insert an intratracheal tube by direct vision technic, under emergency circumstances, when coolness and dispatch are of primary importance. The operator should be prepared to perform an emergency tracheotomy if necessary.

METHOD OF ADMINISTRATION—It has been our practice to combine thiopental sodium with other agents, principally nitrous oxide. Often combination thiopental sodium and block anesthesia is used, especially for complete lower alveoplasty where there may be a great deal of hemorrhage and jaw drop is hard to control.

Advantages—The advantages of thiopental sodium combined with nitrous oxide are:

1. Minimal amounts of thiopental are used, many times only for induction,

3. Krogh, H. W., Use of Thiopental Sodium in Dental Surgery, *J.O.S.* 5:337 (Oct.) 1947.

thus increasing safety. This method takes advantage of the excellent recovery properties of nitrous oxide.

2. Quick, pleasant induction.

3. There is low toxicity and a high percentage of oxygen.

4. Nausea is rare.

5. Nitrous oxide depresses pharyngeal reflex and reduces tendency toward laryngeal spasm.

Disadvantages—The disadvantages of the thiopental sodium and nitrous oxide combination are:

1. Equipment set-up is rather elaborate.

2. Thiopental sodium causes "signs of depth" to be masked—overdosage, producing a histotoxic anoxia without evident anoxic anoxia, can occur, thus causing sudden respiratory failure. Decrease in respiration, arterial pressure and heart rate are delayed, but may occur suddenly.

3. Thiopental sodium increases possibility of laryngospasm.

4. Thiopental sodium may have a cumulative effect.

5. Venipuncture is sometimes difficult.

6. It is preferable to work on a table, making mandibular operations more difficult.

CONTRAINDICATIONS — Contraindications to the use of thiopental sodium are listed here:

1. Overdevelopment of neck and jaw musculature, or flaccid tissue around the larynx.

2. Jaundice.

3. Asthma.

4. Extremes of age.

5. Infections of floor of mouth and neck.

6. Anemias and extreme debility.

7. Cardiac disease with decompensation.

8. Diabetes—it is difficult to determine required dosage.[6]

PREMEDICATION—None is necessary for short operations. Adapt the premedication to the individual. Atropine sulfate, 1/150 grain (0.0009 Gm.) intravenously administered just before induction, is an excellent premedication. The object is to decrease the incidence of laryngospasm. No morphine is given, as it frequently produces postoperative nausea.

Pentobarbital sodium is not used because it prolongs recovery and further masks the anesthetic signs. Combinations of morphine sulfate and pentobarbital sodium ordinarily should not be used for this reason.

PREPARATION OF SOLUTION—A 2 or 2½ per cent solution will decrease the possibility of laryngospasm, and lessen the likelihood of phlebitis and irritation to the extravenous tissue if injected outside the vein.

TECHNIC—It is our practice to use the Hubbel injector and allow the needle to remain in the vein throughout anesthesia. This allows for fractional dosage. An eccentric syringe taped to the arm is satisfactory for many cases. The Hubbel injector requires more care in maintenance and preparation, but is valuable in a busy

6. Joblin, J. M., The Effect of Phenobarbital on the Action of Insulin. *Endocrinology* 40:426 (June) 1947.

practice. For short operations the supplementary nitrous oxide may be dispensed with and a technic such as described by Krogh,[5] Hubbell[7] and Olsen[8] is generally used. For an average case a mouth prop is inserted, about 10 cc. of thiopental sodium is injected and, as soon as the patient shows evidence of loss of environmental consciousness, a nasal inhaler adapted from one described by Bullard and Brockett[9] is applied. It is retained by a four-tailed retention strap, assuring control of the gas leak factor. The head and nosepiece are then covered with a towel in a manner which allows examination by the anesthetist when necessary. A mixture of 50 per cent nitrous oxide and oxygen is supplied through the nasal inhaler at about 5 to 7 mm. of pressure.

The depth of anesthesia is lightly tested by stimulating the laryngeal reflex with the fingers. A barricade gauze pack or synthetic sponge is inserted and an additional gauze pack of suitable size is placed against the velum on the side to be operated on first. This method of mouth packing allows for greatest use of the gases and is meant to exclude air, thus differing from cases in which only thiopental sodium is used.[5] After a few minutes the amount of oxygen is reduced to 25 per cent.

The respirations, which may be quite shallow, must be carefully observed. Signs of anesthesia are essentially the same as described in the discussion of nitrous oxide, though they are much less evident. The excitement stage is absent. Maintenance of the airway is the prime consideration. Careful support of the jaw is often necessary when the patient is supine. If the patient is in an upright position, there is an advantage in airway maintenance because there is less tendency for the jaw to fall back, but this is a disadvantageous position for operations on the maxilla. Some anesthetists, in an effort to improve the airway, maneuver the patient's head and neck into an extreme backward position. This is just as productive of airway irritation and obstruction as jaw drop and should be discouraged. An increase in pressure to 10 or 12 mm. of the nitrous oxide-oxygen often is all that is necessary to improve ventilation.

The patient may show some sign of returning consciousness, such as moving of the legs or pronation of the arm with the needle in the vein, but further thiopental dosage is not required until definite protective muscular effect is observed. When such signs appear, 2 to 5 cc. are given promptly for control of depth. Variations in nitrous oxide percentage or thiopental dosage are a matter of determining the individual patient's requirements. This ability is acquired only by experience.

When the operation is completed, the respiratory center is stimulated and the lungs are well ventilated for a few minutes with oxygen. Care is taken to place gauze packs in such fashion as to prevent blood reaching the larynx, and recovery is carefully watched until the patient becomes aware of his surroundings.

7. Hubbell, A. O., and Adams, R. C., Intravenous Anesthesia for Dental Surgery with Sodium Ethyl (1-Methylbutyl) Thiobarbituric Acid. *J.A.D.A.* 27:1186 (Aug.) 1940.

8. Olson, B. A., Pentothal Sodium Anesthesia; Indications and Contraindications. *J.A.D.A.* 32:67 (Jan.) 1945.

9. Bullard, O. K., and Brockett, S. I., Combined Pentothal Sodium-Nitrous Oxide-Oxygen Anesthesia in Oral Surgery. *J.O.S.* 3:138 (April) 1945.

EMERGENCIES—It is true that too light anesthesia will often produce coughing, especially if the mouth pack is out of place.[9] Experience teaches when a light cough requires correction by deepening the plane of anesthesia. Moderate increase in thiopental dosage or a decrease in the oxygen percentage will suffice. Moderate sneezing and hiccups may be handled in the same manner. Occasional tremor occurs; it may be a manifestation of light anesthesia, or it may be a persistent tetanic tremor, calling for change to another type of anesthetic. Treatment of severe coughing or laryngospasm consists of prompt forced oxygen. The emergency valve should be used, but in order to avoid errors, the mixing valve should be changed to 100 per cent oxygen also. The operator should check the airway for secretions, blood or other possible irritants, being careful while doing so to avoid complicating the spasm further by allowing blood to run down the throat. If no preoperative atropine was administered, 1/150 grain (0.0009 Gm.) may be injected intravenously. It is not advisable to administer more thiopental sodium for the purpose of deepening anesthesia to stop laryngospasm. The airway should be cleared, using efficient suction equipment and a long pharyngeal aspirator tube. It is best to elevate the mandible to insert the laryngoscope. The epiglottis is then elevated and an endotracheal tube inserted orally. Tubes made of synthetic rubber are more easily inserted in an emergency than pure rubber tubes. The lungs can be inflated by blowing into the tube once or twice; then force oxygen through the endotracheal tube. When respiratory embarrassment occurs, oxygen under pressure and early artificial respiration constitute the correct treatment. Most often these measures will correct the trouble, but unfortunately there is an occasional spasm requiring prompt and positive use of the laryngoscope and endotracheal tube. Analeptics may be warranted in desperate circumstances, and pentamethylenetetrazol, 1 cc. intravenously, is probably the most effective, though in some instances analeptics may produce further depression.[10] If there is danger of cardiac failure, epinephrine injected intravenously or into the myocardium may be of value. An emergency tracheotomy should be performed if respiratory embarrassment cannot be relieved by other means.

Anyone who does any kind of surgery should be prepared to massage the heart to revive a too deeply anesthetized patient. An incision may be made at the fourth or fifth intercostal space from just anterior to the left midaxillary line to the border of the sternum. A rib cutter or any type of fairly strong rongeur forceps may be used to separate a rib.[11]

■ *Comments*

The salient factors in anesthesia technic for oral surgery have been reviewed. We have sought for brevity and practicality and have, therefore, excluded many physiologic factors. Etsten and Himwich[12] state that there are four stages of Pentothal anesthesia possessing diagnos-

10. Mousel, L. H., and Essex, H. E., An Experimental Study of the Effects of Respiratory Stimulants in Animals Under Pentothal Sodium Anesthesia. *Anesthesiology* 2:272 (May) 1941.

11. Lahey, F. H., and Ruzicka, E. R., Experiences With Cardiac Arrest. *Surg., Gynec. & Obst.* 90:108 (Jan.) 1950.

12. Etsten, B., and Himwich, H. E., Stages and Signs of Pentothal Anesthesia: Physiologic Basis. *Anesthesiology* 7:536 (Sept.) 1946.

tic signs which represent a descending neuroanatomic allocation with deepening anesthesia (Fig. 1). It must be realized, however, that these changes do not take place in an abrupt, stepwise manner, but develop gradually from one stage to the next. The earliest clinical changes are associated with depressions of the cerebral hemispheres and the latter ones with the lower phyletic areas of the brain. Quastel[13] has shown that barbiturates inhibit cerebral oxidations. Etsten and Himwich[12] believe that this interference with brain metabolism is directly related to the clinical signs of anesthesia. When the histotoxic anoxia becomes sufficient to produce moderate surgical anesthesia (Fig. 2, Stage III, Plane II), there will generally be depressed pulmonary exchange and reduced arterial oxygen. Anoxic anoxia is thus superimposed upon the existing histotoxic

13. Quastel, J. H., Respiration in the Central Nervous System. *Physiol. Rev.* 19:135 (April) 1939.

STAGE	ANESTHESIA	CHARACTERISTICS	SITE of DEPRESSION	BRAIN
I	CLOUDING	EUPHORIA LOSS of DISCRIMINATION TO IMPAIRMENT of ENVIRONMENTAL CONTACT	SLIGHT DEPRESSION of CORTEX TO MODERATE DEPRESSION of CORTEX	
II	HYPER-SENSITIVITY	LOSS of CONSCIOUSNESS	PREDOMINANT CONTROL by SUBCORTEX	
III Plane I	LIGHT SURGICAL	HYPOACTIVITY to PAINFUL STIMULUS	MODERATE DEPRESSION of SUBCORTEX	
Plane II	MODERATE SURGICAL	LOSS of SOMATIC RESPONSE to PAIN	PREDOMINANT CONTROL by MIDBRAIN	
Plane III	DEEP SURGICAL	LOSS of VISCERAL RESPONSE to PAIN	MODERATE DEPRESSION of MIDBRAIN	
IV	IMPENDING FAILURE	FALL in PULSE PRESSURE	MODERATE DEPRESSION of PONS	

Fig. 1.—A Correlation between the stages of Pentothal anesthesia and the outstanding clinical signs and their neuroanatomic allocations[11]

STAGES OF ANESTHESIA	PUPIL SIZE	PUPIL REACT. TO LIGHT	PUPIL REACT. TO PAIN	EYE-BALL ACTIVITY	EYELID TONE	CORNEAL REFLEX	RESP.	MUSCLE REACT. TO PAIN	PULSE	B. P.
STAGE I	4+	4+	4+	VOL.	4+	4+	N	4+	N	N
STAGE II	4+ To 3+	4+	4+	ROVING	4+ To 2+	4+ To 0	O N	6+	N	N
STAGE III PLANE 1	3+ To 2+	3+ to 1+	3+	SLIGHT	2+ To 0	4+ To 0	DIM	1+	N	SLIGHT FALL
PLANE 2	2+ To 1+	0	2+	DEVIAT THEN CENTRAL	2+ to 0	4+ to 0	DEPR.	0	INC.	VARIES
PLANE 3	1+	0	0	CENTRAL	0	0	DEPR. TO APNEA	0	INC	VARIES
STAGE IV	DILATE WITH ANOXIA	0	0	CENTRAL	0	0	APNEA	0	INC.	FALL IN PULSE PRESS.

Fig. 2.—The series of clinical signs are correlated with the four stages of Pentothal anesthesia[11]

anoxia, causing the brain to labor under a double handicap. (This occurs in a "working stage" of anesthesia.) This demonstrates the value of combined anesthesia.

Further evidence to support this conclusion has been advanced by Barton, Wicks and Livingstone[14] in a study of the effect of thiopental alone and in combination with oxygen or nitrous oxide-oxygen on arterial blood gases. They tested arterial blood values for oxygen and carbon dioxide on six patients and six dogs (1) prior to anesthesia, (2) after thiopental sodium alone, (3) after giving 100 per cent oxygen with thiopental, and (4) after giving a mixture of 50:50 nitrous oxide-oxygen and thiopental. They noted that the respiratory depression inherent in thiopental anesthesia is not significantly improved by giving either oxygen or the 50:50 mixture of nitrous oxide-oxygen, but that their administrations with thiopental produced a definite increase in blood arterial oxygen values, and that this might make all the difference between a mild continuing anoxia and a normal state. They noted the value of simultaneous administration of 50:50 nitrous oxide-oxygen with thiopental sodium as opposed to 100 per cent oxygen and thiopental sodium. The blood oxygen and carbon dioxide values are almost identical under the two conditions, while the total dosage of thiopental sodium to maintain the same plane of anesthesia is only one-fourth that necessary when thiopental sodium alone or with oxygen is used.

This feature is valuable for long operations, as it reduces the possibility of danger from the cumulative effect of long continued administration of thiopental sodium alone.

14. Barton, G. D.; Wicks, W. R., and Livingstone, H. M.: The Effect of Pentothal Alone and in Combination with Oxygen or Nitrous Oxide-Oxygen on Arterial Blood Gases. *Anesthesiology* 7:505 (Sept.) 1946.

Bachrack[15] arrived at similar conclusions and states "An analysis of cases reveals that the amount of Pentothal alone necessary for satisfactory anesthesia varied greatly and could not be predetermined for any given patient." There were some patients in whom skin reflexes could not be obtunded completely even when thiopental sodium was pushed to the point of moderate respiratory depression. These patients moved each time the surgeon incised the skin, occasionally to a degree which interfered with the operation. In no instance did this occur when nitrous oxide and oxygen were added.

Allen and others[2] graphically illustrate the response to asphyxia in dogs, (a) unpremedicated, (b) premedicated with morphine and atropine, and (c) during thiopental sodium anesthesia (Figs. 3 and 4).

■ *Summary*

The successful use of general anesthetics requires an understanding of the advantages and disadvantages of each agent used. A balance may be achieved

15. Bachrack, E. H., Pentothal Nitrous Oxide-Oxygen Anesthesia. *New York State J. Med.* 47:994 (May) 1947.

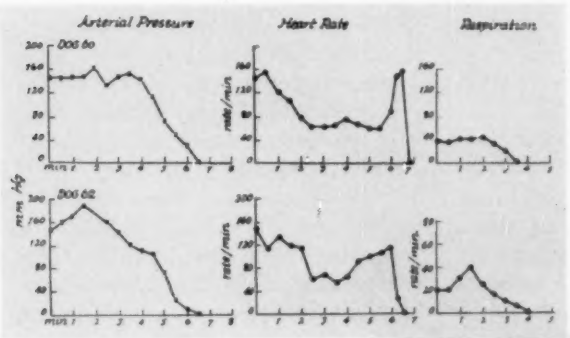
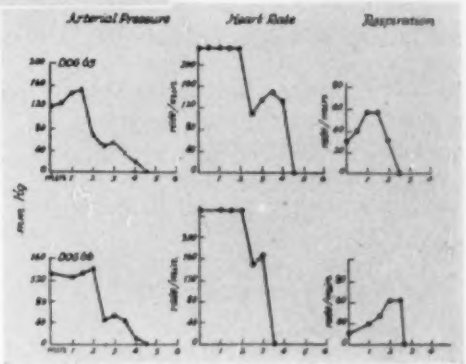


Fig. 3.—Response to asphyxia during nitrous oxide anesthesia[2]

Above: Unpremedicated dogs

Right: Dogs premedicated with morphine and atropine



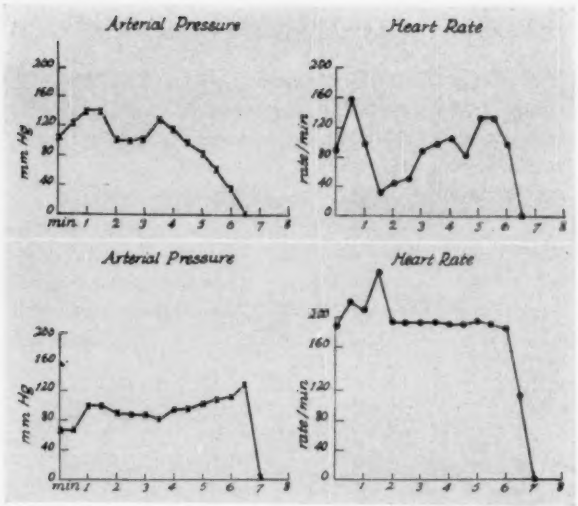


Fig. 4.—Comparison of circulatory changes during asphyxia of unanesthetized dog with changes in the same dog when anesthetized with Sodium Pentothal.[2] Above: Asphyxia without anesthesia. Below: Asphyxia during Sodium Pentothal anesthesia

by combining nitrous oxide with synergists, thus avoiding anoxia.[16]

Inability to satisfactorily administer inhalation anesthetics is no license to start using thiopental sodium. In fact a comprehensive knowledge of gaseous anesthesia is an important prerequisite. Therefore, the salient technical points in administration of nitrous oxide have been reviewed. The indications and contraindications for other types of anesthesia hold true for thiopental sodium, but greater caution needs to be exercised in its administration, as it is a respiratory depressant, and only highly trained persons should attempt its use. Offices that are not equipped with hospital facilities should not administer general anesthetics, especially thiopental sodium.

There is not much that is new in the field of intravenous anesthesia and it appears that it is complementing other methods rather than displacing them. Our experience has led to the conclusion that, though thiopental sodium is satisfactory for short simple cases, its principal use should be as a supplementary agent.

16. Lundy, J. S., Balanced Anesthesia. *Minnesota Med.* 9:399 (July) 1926.

Radiologic management of malignant oral lesions

■ *H. F. Doane, D.D.S., Detroit*

Radiation therapy in the treatment of malignant lesions includes the use of the roentgen rays and the gamma rays from radium and other radioactive materials. There are many technics available for their use, and each has its merits. The technics described here are those used by T. Leucutia, J. C. Cook and W. C. Cooley in the department of radiation therapy at Harper Hospital, Detroit, Michigan. Each method can be modified to suit the individual case and the problem presented.

■ *Carcinoma of the Lip*

Carcinoma of the lip, in the first clinical stage, is given treatment similar to the treatment used for skin carcinomas on other parts of the body. External roentgen therapy is preferred to interstitial radium therapy, as it is less painful and the esthetic results are more satisfactory. A combination of 110 kv., peak, and 135 kv., peak, is used without filter. A total of about 3,500 r (in air) is given to the lesion, which is a single hypermassive, unfiltered, caustic dose. If the lesion is more than 2 cm. in thickness, approximately 500 r (in air) of the 3,500 r are given with 200 kv., 1.5 mm. copper plus 1 mm. aluminum filter, half-value layer 1.9 mm. copper.

In treating a lesion of the lip, the mucosal surface is allowed to dry and an everted position is maintained with adhesive tape. The area treated includes at least 0.5 cm. of normal skin border, and it is delineated by means of lead plates with an appropriately sized window. If the lip cannot be conveniently everted, a lead shield is placed intraorally beneath the region treated to protect underlying structures.

No immediate change can be noted in the lesion after the treatment. After a week or more the region becomes erythematous and small vesicles develop. A crust forms later, and the reaction is at its height approximately four weeks after the treatment. When the patient returns for an examination, the crust is removed, leaving a clean granulating base. Another crust may or may not develop. Epithelization takes place from the periphery inward, and at the end of ten weeks the region will have filled in, leaving a smooth scar.

Treatment of the regional metastases consists of radical block dissection of the lymph nodes of the neck, especially if the lesion is a squamous cell carcinoma, or is of Broders'[1] classification, grade III or IV.

According to Duffy,[2] neck dissection is indicated if (1) the primary lesion is

1. Broders, A. C., The Squamous Cell Epithelioma of the Lip: A Study of 537 Cases. *J.A.M.A.* 74:656 (March) 1920.
2. Duffy, J. J., Cervical Lymph Nodes in Intraoral Carcinoma: Surgery or Irradiation? *Amer. J. Roentgenol.* 39:767 (May) 1938.

controlled; (2) the primary lesion is limited to one side of the oral cavity; (3) the primary lesion is a highly differentiated cell type; (4) cervical metastases are present and are limited to one group of nodes, or nodes in two contiguous cervical triangles; (5) the capsules of the nodes are not infiltrated by the carcinoma; (6) the opposite side of the neck is free of metastasis; (7) there is no distant metastasis present; (8) the patient is in good physical condition. All indications must be present for the case to be operable and the absence of any one indication excludes neck dissection.

While these rules may not be followed exactly in all cases, they do constitute a general basis for treatment procedure.

After surgical intervention, the regions are irradiated with roentgen radiation, using the following factors: 500 kv. (constant), 7 mm. copper, 3 mm. aluminum and 3 mm. cellophane filter, 20 r per minute (in air), 60 cm. skin target distance, half-value layer 9 mm. copper. The treatments are fractionated and protracted. The open port method is used (field delineated by lead plates), and the ports are large (15 by 20 cm.).

Care is taken to protect the chin, nose, larynx and hair. This is important, as tissue necrosis and prominent epilation may result if these parts are not protected properly. It is advisable to remove all dead or decayed teeth before radiation therapy is begun. If they are removed later, oral infection, osteomyelitis or permanent ulceration in the oral tissues may result.

Two lateral ports are used and one is treated with a dose of 200 r (in air) per day. A total of 2,000 r (in air) is given to each of the two ports. Thus, a series of treatments for the region takes twenty days. The series is repeated in two months, using a total of 1,400 to 1,600 r (in air) per field, with the same technic. A third series can be given in another two months, but with a total of only 1,200 r (in air) per field.

■ *Intraoral Carcinoma*

The treatment of intraoral carcinoma by radiation therapy consists of external roentgen therapy accompanied by intraoral application of radium, either by surface or interstitial means. In the past few years, there has been a tendency to partially replace the radium with intraoral roentgen therapy, using special apparatus and cones. However, this method is not in use here at the present time. At this hospital most types of intraoral carcinoma are treated by radiation therapy, used alone or in combination with surgical intervention. The factors are the same as for the lesions of the lip: 500 kv. (constant), 7 mm. copper, 3 mm. aluminum, 3 mm. cellophane filter, 20 r per minute, 60 cm. skin target distance, half-value layer 9 mm. copper. Again, special attention is given to protect the nose, chin, larynx and hair. Daily doses of 200 r (in air) are given, cross firing through 2 to 3 ports for a total of 2,000 r (in air) per field for the first series, which takes from twenty to thirty days. A second similar series is given two months later, and from 1,400 to 1,600 r (in air) are given over each field. Two months later a third series is given, with a total of 1,200 r (in air) per field.

Radium molds is used, whenever possible, directly over the lesion. In some

cases, such as carcinoma of the tongue, interstitial needling can be done. However, interstitial application of radium in the tongue is limited almost entirely to cases in which the lesion is in the anterior region of the tongue. It is used occasionally for small lesions at the base of the tongue. The majority of the lesions at the base of the tongue are treated by external roentgen therapy, using several ports. Lesions in the floor of the mouth are treated by external roentgen therapy and the application of radium in molds, although in some instances interstitial application of radium may be used. For lesions in the buccal mucosa, external roentgen therapy and interstitial application of radium are employed.

Lesions of the gingivae and of the hard palate are treated with external roentgen therapy and application of radium in molds. Lesions of the soft palate are treated with external roentgen therapy, using three ports. In all instances, however, the treatment and method used are varied according to the individual case. In the cases where radium is used, about 3,000 to 4,000 gamma roentgens are delivered to the lesion, in addition to the roentgen therapy. The radium treatment can usually be repeated only once in six months.

In far advanced intraoral carcinoma with metastases, palliative roentgen therapy is given. In these cases, the dosage is less, and the purpose is to retard the growth of the neoplasm, decrease the infection and aid in the cleansing and freeing of the slough.

The reaction expected from roentgen and radium treatment is an erythema of the skin over the region treated, which occurs toward the end of the series and which gradually gives way to a dry desquamation and tanning. The lesion, if radium has been used, develops a tenacious whitish membrane, which is at its height in four weeks, and when an attempt is made to remove it bleeding occurs. The membrane disappears in about six to eight weeks, leaving a whitish scar.

■ *Odontogenic Tumors*

Lesions in the bone structures of the maxilla and mandible are usually treated by external roentgen therapy, although radium application is used occasionally, especially in certain lesions of odontogenic origin.

Roentgen irradiation of osteogenic sarcoma is similar to that used in intraoral carcinoma. Using the same technic, a total dosage of 2,000 to 3,000 r per field is given over a period of twenty to thirty days. Within six weeks the lesion is resected, if possible. This is followed by irradiation over the regional lymph nodes and prophylactic irradiation over the lung fields. If the lesion is not resectable, two or three series of treatments are given at two to three month intervals, using the technic employed in the treatment of intraoral carcinoma.

Giant cell tumor is treated with 200 kv., 350 to 400 r per field, or 500 r per field with 500 kv. The treatment is repeated in two months, with a 10 per cent reduction in the dose. The treatment is repeated at regularly spaced intervals, extending possibly over a two year period.

Odontogenic tumors are treated primarily by surgical intervention, but in the highly cellular regions radiation is given, using a technic similar to that described

for bone tumor. A greater use of radium is made, since, in addition to the roentgen therapy, 3,000 to 4,000 gamma roentgens can be given with the same technic used in intraoral carcinoma.—*10 Peterboro Street.*

The third molar problem

■ *Spencer R. Atkinson, D.D.S., Pasadena, Calif.*

In this discussion of the third molar problem, my object is to describe some aspects of the growth and behavior of third molars which may be of interest to oral surgeons.

The specimens studied consist of 1,000 human mandibles and maxillae under 18 years of age, plus an additional 1,000 complete skulls, ages from before birth to old age.

According to previous teachings, the permanent first molars of both the mandible and maxillae have a most favorable opportunity to erupt in perfect position as they are given off distal to the deciduous second molars. In this favored position there are no teeth above them; consequently there are no roots to resorb. Permanent second and third molars also have these advantages. Apparently the difficulty of eruption increases with each distal tooth, so that various impactions of third molars seem to be the rule, rather than the exception.

In this group of 1,000 skulls from 14 different countries there are 312 impactions of third molars and no impactions of first molars. There are dozens of missing third molars; sometimes only one is absent, in other skulls, two, three, or perhaps all four molars have not developed or, having developed, have failed to erupt.

In a group of 200 adult skulls, with teeth in good or normal occlusion, are specimens which lack from one to four third molars. In this group, the missing third molars seem to have had no influence whatever in jaw development, arch form, occlusion of the teeth, or tight contacts (Fig. 1).

Among the young adult skulls, with teeth in normal occlusion, there are several specimens with third molar impactions of various degrees of severity in either jaw. These impactions were potential factors which, in time, might be expected to upset the balance of occlusion; therefore, their removal would have been indicated (Fig. 2).

In the great majority of adult skulls examined, there was evidence of retromolar infection or abscess (Fig. 3). In other words, if the third molar was present, it was the exception rather than the rule to find evidence of a healthy condition in the retromolar region (Fig. 4).

Third molars, as such, should not be condemned. In rare instances there are good and beneficial third molars which should be cared for and preserved with

Fig. 1.—Lack of third molars seems to have no effect upon jaw development. Contact points are tight, the retromolar areas are clean and free from infection. Arch form and position of the maxillary first molar in relation to the key ridge are normal

the same attention as is bestowed on other teeth (Fig. 5). But again there are third molars which, if left alone, will impair and damage the chewing mechanism. For instance, those third molars deeply embedded in a more or less horizontal position are apt to resorb the distal root of a perfectly good second molar. If the tooth lies near the surface, a food pocket will be formed, harboring decaying debris and pus. In such situations, the investing membrane of the distal root of the second molar will be destroyed, and caries and dissolution of neighboring alveolar bone will follow.

Should the third molar be embedded with a forward and occlusal inclination, it will tend to elevate the second molar in its socket. In such a position, traumatic occlusion is established; the second molar, in an extruded position, is subject to extra force brought to bear on its crown during closure of the jaw while chewing or swallowing (Fig. 6). The result is a hammering of the molar teeth forward, causing bicuspids and cuspids to lean toward the midline, bunching the anterior teeth and playing havoc with what might otherwise have been an excellent chewing apparatus.

The histologic development of the teeth, including that of the third molar, is well known. However the sometimes erratic behavior of this molar is not explained. To date, no formula has been discovered which will lead to an accurate estimate of probable development in form, position, eruption or noneruption of the imperfectly understood third molar.

In one skull, for instance, the third molar was given off as usual, distal to the second molar. Instead of growing down into the body of the mandible, it traveled upward and backward just under the periosteum, well up toward the coronoid process, retaining its gubernaculum while drifting. In this specimen the channel which was occupied by the gubernaculum remained (Fig. 7).

Normally a tooth erupts along the

Fig. 2.—Mandible of a young adult with third molar impaction which, if ignored, is a potential factor in causing infection of tissue, injury to second molar and malocclusion

Fig. 3.—Typical example of a chronic retromolar abscess, extending downward into the spongy bone of the mandible. It is an active menace to the individual's health and a constant threat of serious complications

path of the channel which contains the gubernaculum of the tooth follicle. If, for some reason, the tooth bud is misdirected or deflected at the time root formation begins, the movement of the tooth crown will also be diverted in the same direction and will leave the gubernaculum opening behind, undisturbed (Fig. 8). This channel is composed of dense bone similar to that which forms the sheath, or covering, of the mandibular nerves and vessels.

Such conditions are encountered in connection with impacted mandibular cuspids. They are usually apparent in roentgenograms. It is a question whether or not to close the open channel after an operation has been performed for the removal of the tooth.

Fig. 4.—Serious conditions may result from neglected infections so often occurring in bone adjacent to, and immediately distal to, the third molar tooth

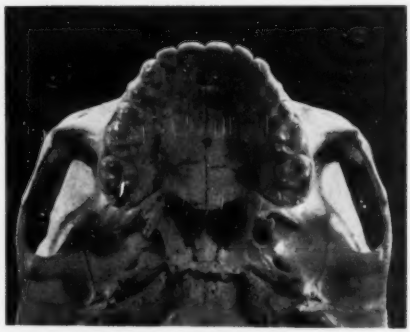


Fig. 5.—Maxilla approximately 14 years old, showing ample development for this age. No third molar difficulty would be expected

■ *Path Traveled by Maxillary Third Molar During Growth*

The maxillary third molar travels the same relative path as that which is traversed by the deciduous second molar and the permanent first and second molars. That is, the crypt of the tooth begins to develop just beneath the posterior floor of the orbit and lateral to the external pterygoid plate (Fig. 9). The previously mentioned teeth, as they grow, travel downward, outward and forward, exactly under the

floor of the maxillary sinus. The floor of the maxillary sinus and the roof of the crypt containing the developing tooth are part of the same plate of bone (Fig. 10). It would appear that severe inflammation of the lining membrane of the maxillary sinus, which is in such intimate contact with the wide open ends of the developing teeth, would have an adverse influence upon the health of the tooth pulp and the quality of forming dentin.

Fig. 6.—The third molar, erupting in a forward and upward direction, often slightly extrudes the second molar and causes it to be hammered forward during chewing, or when the jaws are closed forcibly

This, however, has not yet been demonstrated.

The deciduous second molar completes practically half a circle; the permanent first molar travels almost as far; the permanent second molar does not move quite as far as the first; the permanent third molar completes an arc of about 90 degrees.

The row of deciduous molar teeth occupies a position entirely lateral to the pterygoid plates of bone and naturally

Fig. 7.—The third molar originated in a crypt directly distal to the permanent second molar. Its migration to its present position may be traced by the channel of the gubernaculum of its follicle, which still remains. Early extraction would have eliminated the possibility of this condition

lateral to the posterior nares (Fig. 10). At approximately 3 years of age, the greater palatine canal lies opposite the deciduous second molar, whereas at maturity it is opposite, or just distal to, the third molar.

Fig. 8.—The probe occupies the opening of the gubernaculum of the cuspid follicle. As the root developed the crown moved forward, incidentally causing damage to the roots of the incisor teeth. The opening of the channel of the gubernaculum remains after the removal of the cuspid. How long it remains has never been demonstrated

The transverse palatine suture, or suture between the maxiliary and palatine bones, at birth, is opposite the midportion of the deciduous second molar (Fig. 11). At the age of 20, it is opposite the center of the permanent second molar (Fig. 12).

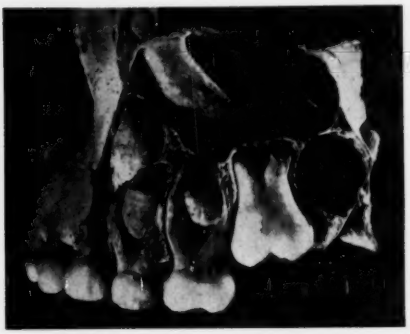


Fig. 9.—Maxilla approximately 5 years old. The crown of the deciduous second molar at age 1 occupied the same relative position as does the crypt of the follicle of the permanent second molar. As growth continues, the follicle of the permanent third molar will appear distal to that of the second; all the posterior teeth move forward and downward. See Figure 10

At birth, the key ridge on the outer surface of the maxillae is opposite the deciduous first molar; at maturity, the mesiobuccal root of the permanent first molar is directly under this ridge of bone.

About, or up to, 12 years of age, the tuberosity of the maxillae is lateral to the two pterygoid plates and pyramidal process of the palatine bone. As the nares widen with the growth of the skull, there is a relative forward movement of the tuberosity and dental arch, while the posterior nares widen laterally. As a result, at maturity the tuberosity is directly anterior to the pterygoid plates which, with the pyramidal portion of the palatine bone, act as a buttress or support to the maxillae. Should this forward growth of the teeth be retarded, or the lateral growth of the nares be inhibited, the third molar will not have sufficient room for eruption in the dental arch and will have a tendency to lean or incline toward the cheek (Fig. 13).

When the third molar begins to calcify, the occlusal surface of the crown is directed almost straight backward. As growth continues and the tooth drifts forward and downward it begins to take a more upright position, swinging around the periphery of an arc, in which the center of the circle is almost above the center of the malar bone. In this instance the crown travels the greater distance, the apex the lesser distance (Fig. 14).

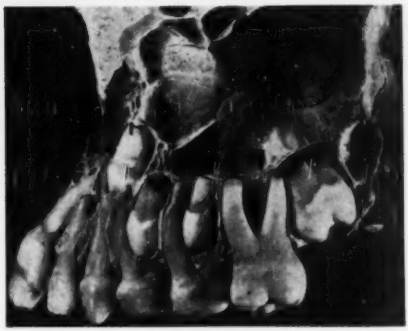


Fig. 10.—The crypt of the third molar is apparent at 7 years of age in the same relative position as that of the deciduous second molar at 1 year of age, or of the permanent first molar at 3 years of age, or of the permanent second molar at 5 years of age

■ *Path Traveled by Mandibular Third Molar During Growth*

The opposite is true of the inclination of the growing teeth in the mandible. The crown of the third molar is given off not exactly between the buccal and lingual plates of bone in the mandible, but rather toward the lingual plate above the mylohyoid ridge. The young tooth will grow in the spongy bone of the retromolar region. The calcifying crown of the mandibular molar points decidedly in a forward and somewhat lingual direction. As growth continues, the apex of the root and not the crown, as in the maxillae, travels around the arc of a circle, the center of which is approximately the same as that of the maxillae.

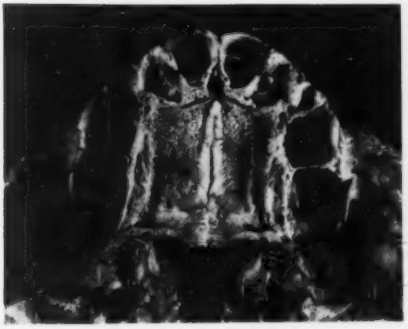


Fig. 11.—At birth, the transverse palatine suture is opposite the midportion of the deciduous second molar. The greater pa'atine canal is medial to the distal surface of the second molar; the key ridge lies over the mesiobuccal root of the first molar

In the case of the mandibular third molar, the apex of the root is forced to travel a much greater distance than the crown, or almost exactly the reverse of the condition found in the maxillae (Fig. 14). This accounts for the apparent ease with which, if a permanent first molar or second molar should be removed prematurely, the maxillary second or third molar, as the case may be, is brought into a forward position to replace the lost tooth. This is because the tooth is to be moved along the line in which the crown seems to tip forward, very little root movement being required. However, in the mandible the opposite condition prevails, and the root of the tooth would have to be moved a much greater distance than the crown. In chewing, the tendency is to hammer the crown of the mandibular molar forward. This makes it difficult, and sometimes impossible, to bring the posterior mandibular molars in an upright position into the space made by the loss of either the first or second molars, without extensive damage

Fig. 12.—The transverse pa'atine suture, at 20 years of age, is normally opposite the midportion of the permanent second molars. The greater palatine canal is now lingual to the distal portion of the third molar, while the key ridge lies directly over the mesiobuccal root of the first molar

Fig. 13.—The forward drift of the maxillary teeth failed to synchronize with the lateral growth of the posterior nares, resulting in the third molar being forced to erupt outward toward the cheek

Fig. 14.—The occlusal surfaces of the crowns of developing maxillary molars face backward and downward; in coming into occlusion, the crown travels the greater distance. The opposite is true in the mandible. The occlusal surfaces of the crowns face forward and downward; hence the apex of the molar travels the greater distance

to the tooth, especially to the pulp.

An added difficulty encountered in attempting to bring a third molar into position, after the extraction of a mandibular second molar, is that the labial and lingual walls of the mandible immediately seem to begin to converge. This forms a barrier of hard cortical bone through which it is difficult, and at times, in late adolescence, impossible, to move molar teeth, orthodontically or otherwise.

■ *Comments*

The absence of third molars seems to have no harmful effect on the dental arches. In the great majority of cases, their presence acts as a menace. It would seem wise to remove these teeth as soon as possible if, after careful analysis, they are deemed to be potential detrimental factors.

Mandibular third molars may be removed before the roots are formed, and thus lessen possible harm to the root formation and supporting soft tissues of the second molars. Because of the difficult position of the maxillary third molar, its removal is seldom indicated at as early an age as the mandibular third molar.

By early removal: (1) damage to the second molar is decreased; (2) there is a minimum of scar tissue formation, the contraction of which might cause a food pack between the first and second molars, or shrinking of tissue distal to the second molar, accompanied by consequent exposure of dentin, thereby predisposing to caries the distal surface of the second molar.

Early removal tends to prevent undesirable forward tilting of the posterior teeth.—65 *North Madison Avenue.*

Plastic surgical correction of oral deformities

■ *H. O. Bames, M.D., Los Angeles*

Professional conversation with dental surgeons has brought out the fact that not infrequently, after the most complete, meticulous and even impeccable orthodontic treatment, when the last band has been taken off and the patient looks with evaluating eyes at the finished product, there is a certain doubt and hesitation in voicing satisfaction, which more than words themselves expresses not quite complete happiness over the result.

Since there is no question whatever about the quality and success of the intraoral work, what then is the reason for this reaction? Strange as this may seem, whatever it is, it is usually just as obvious to the dental surgeon as it is to the patient and to his family and friends.

The important difference in evaluation lies in the fact that while the dental surgeon corrected everything possible within his field, and therein presented a job well done, the patient expected that this intraoral treatment would, *ipso facto*, also correct all the outwardly visible irregularities of facial features in that region.

The patient's viewpoint is not only quite natural, it is even a carefully nurtured impression, popularized by every toothpaste or toothbrush ad in print, radio and television. These do not refer to a splendid occlusion, an excellent bite, or evenly spaced teeth, although these are the very foundation of good oral appearance. The accent is all on the flashiness of the smile, visible attractiveness and the esthetic factor.

The dental surgeon certainly never had any intention of altering the surrounding structures except as they were expected to respond indirectly but nonetheless favorably to the basic orthodontics. This expectation is justified, and usually realized to a satisfactory degree. However, the best of hopes sometimes do not materialize, and part of the problem remains unsolved.

It is also a fact that many individuals concerned over their perioral irregularities, real or fancied, apply to the dental surgeon for correction, and as he finds that functionally the jaws and teeth are essentially normal and certainly not in need of orthodontics, what is he to do to help these people obtain relief from their distress? In the case of a new patient the dental surgeon can decline to enter the issue at all. If, however, the condition still persists subsequent to his ministrations, it is certainly to his advantage and to his credit to treat these conditions himself, if he feels qualified, or to advise the patient where he may go for this special treatment.

A full consideration and proper evaluation of these factors is not exclusively a problem for the dental or plastic surgeon working separately. It may require cooperation and liaison between the two in

order to arrive at a satisfactory solution, and occasionally even psychiatric help may be needed.

Patients are not trained in scientific terminology. To them such terms as prognathism or retrognathism are utterly meaningless. On the other hand, they are fully competent to ask questions such as: "Doctor, don't you think my chin is too weak?" or, "Don't you think my gums show too much?" It is not necessary for them to have had sculptural training, though sculptural evaluation is needed both in visualization of the defect and in the possible correction of it. If the patient is not conscious of the defect, obviously it does not exist as far as he is concerned and he will not apply for treatment.

The two conditions mentioned, too much showing of gum and not enough chin, represent the commonest complaints, and hence will be the most fully discussed. Let it be definitely assumed that any and all regular dental problems have been solved, if not completely satisfactorily, at least as fully and capably as is possible under present available dental scientific knowledge.

■ *The "Weak Chin"*

The weak chin is always caused by an insufficient mandible, regardless of what scientific category such as deficiency might be classified in and regardless of the direct etiologic factor responsible for it; that is, congenital, osteomyelitic, or traumatic. Soft tissue is only relatively deficient, for it generally stretches easily to cover the newly planned larger substructure.

Two substances lend themselves well to implantation and solid integration. They are cancellous bone and hyaline cartilage. A number of other substances have been used. Whatever substance is utilized, it must be shaped to correct the existing defect and implanted in a manner so as to be practically self-retaining. This implies particularly that the implantation bed should be made no larger by dissection than is necessary to accept the implant. The approach is through a transverse submental incision, blended into Langer lines so as to leave practically imperceptible scarring. The implant rests upon the periosteum, not under it.

CANCELLOUS BONE—Cancellous bone is composed of the same cellular element as is the mandible; it affixes itself most solidly and becomes integrated readily. These are advantages of cancellous bone.

To obtain cancellous bone from the ischium is an operation in itself. The new tissue is obtained at the expense of another tissue, which in itself frequently leaves not only the physical but also a "psychological scar"; it cannot be shaped as readily as cartilage and occasionally results in asymmetrical healing. These are the disadvantages of using cancellous bone.

HYALINE CARTILAGE—Hyaline cartilage used for implant is of two types: autogenous, obtained from the patient's own costal cartilage, or preserved homogenous, obtained at autopsy and suitably preserved. Autogenous cartilage has certain advantages. It is easily shaped, becomes integrated readily, does not grow or misgrow as does bone, and generally results in better sculptural form. Bone tends to constitute a clumsier mass.

The objection to autogenous cartilage is the same as in the case of cancellous bone; that is, the necessity of invading and traumatizing normal tissue in order to obtain the implant, leaving an additional remaining scar.

Preserved cartilage has all the advantages of autogenous living cartilage, and but one disadvantage; namely, that as a dead tissue it represents a foreign body, which the organism may not tolerate, and may extrude almost immediately or absorb and eliminate slowly. If extruded almost at once, there is nothing to do except to let the region heal fully and repeat later with another implant. If absorbed slowly, let us say over a period of months or years, the structural effect of the implant may be as definite as if the cartilage were still in place. This is owing to the fact that fibrous tissue invades the intercellular spaces of the cartilage and for all practical purposes replaces its entire structure. The implant, in this sense, becomes living autogenous tissue, which may permanently maintain the original shape of the cartilage. Because this material is so readily available and no additional discomfort or inconvenience is caused to the patient, it has become the material of choice for many plastic surgeons.

■ *Method of Preservation in the Cartilage Bank*

The original preservative used by Brown and DeMere[1] was alcohol. O'Connor[2] and others recommend Merthiolate; still others recommend different chemicals with varying degrees of refrigeration and hydrogen ion concentration.

For many years I have used as a preserving solution potassium mercuric iodide, in 1:5,000 strength. This solution is used without need of refrigeration. Even the newer electrolytic germicides are not superior to this old standby.

Peer[3] has recommended the use of diced cartilage and De Kleine[4] has manufactured a Chondrojet for implanting the diced material through a small entrance wound. Peer prefers autogenous material and has substantiated all his claims by appropriate research.

I prefer a solid piece of material, shaped in exact proportion at the time of operation, to remedy the existing defect.

In correcting a weak chin in men, a good method is use of a single piece of material across the full width of the defect, frequently notched in the portion which fits over the midline, in order to get close coaptation to the mandible. In women, it is better to insert two smaller identical pieces of material, keeping them separated about one-fourth inch in the midline. This is best accomplished by creating two separate implant beds through the same submental incision and by merely leaving the median raphe intact. The single piece of material gives the sculptural effect of a strong square jaw, desirable for men, but most undesirable for women. The separation of the implant into two pieces overcomes this appearance by interposing a median depression suggesting a

1. Brown, J. B., and DeMere, M., Establishing a Preserved Cartilage Bank. *Plast. & Reconstruct. Surg.* 3:283 (May) 1948.

2. O'Conner, G. B., Merthiolate: A Tissue Preservative and Antiseptic. *Am. J. Surg.* 45:563 (Sept.) 1939.

3. Peer, L. A., The Fate of Living and Dead Cartilage Transplanted in Humans. *Surg., Gynec. & Obst.* 68:603 (March) 1939.

4. De Kleine, E. H., The Chondrojet. A Simplified Method for Handling of Diced Cartilage. *Plast. & Reconstruct. Surg.* 3:95 (Jan.) 1948.

small cleft or dimple. Under proper dissection the implant is practically self-retaining, suturing and bandaging being used only to close the entrance wound.

An additional factor for insuring the "take" of a preserved cartilage implant is to acclimatize it first; that is, to implant it temporarily into a well protected region of adequate circulation and leave it there for a month or two. This will ascertain whether the material will be tolerated well by its host, whose system may even change it from an entirely nonliving foreign substance to one partly alive and partly autogenized by invasive circulation. A convenient temporary implant bed is in the abdominal wall or the chest wall. The scar resulting from this intermediate step is minimal compared with the one caused by rib cartilage resection, and so is the risk involved. Preserved cartilage implants upon the mandible result in a high percentage of take and survival. A 90 per cent take is considered a good risk in the direct method of cartilage transplant, but if it can be increased to 99 per cent by this simple step it will be just that much better. If there is an allergic intolerance to the cartilage it can be easily and quickly removed from the temporary bed in the body without damaging effects to the final implant region in the face.

■ *Other Implant Materials*

BOVINE CARTILAGE—Encouraged by the published work of Wardill and Swinney[5] of England, and the supply being low in the bank of human cartilage, it was decided to try to employ bovine cartilage. The material was obtained directly from the xiphisternum of the freshly killed carcasses of young steers under aseptic conditions. The material was beautifully white, extremely easy to shape and in great abundance.

For preservation it was divided into three portions. The first was prepared according to the method advocated by Wardill and Swinney.[5] After dissection of the soft tissues and perichondrium it was immersed in boiling water for one minute and preserved in sterile bottles containing 1:4,000 Merthiolate in normal saline. The preserving solution was renewed the next day and once a week thereafter. The second portion was preserved with Zephiran solution 1:4,000. The third portion was preserved in antiseptic solution of potassium mercuric iodide.

The first two implants were from the batch preserved by Merthiolate according to Wardill and Swinney's[5] method. Within 24 hours the wildest reaction was evident. The chin became more than double in size, the lips became swollen and everted to a tremendous degree. There was seromucosanguineous exudate draining profusely through the entrance wound. Large doses of penicillin and sulfonamide drugs had no effect. Within a week the cartilage was removed and the reaction subsided immediately. What was the cause of it all? Was it an allergic reaction to bovine material in this patient? After a careful history was taken, the bovine material was tried on a second patient, but the results were identical. Was the antiseptic the responsible factor? Or was it a coincidental allergic manifestation?

The third implant was from the

5. Wardill, W. E. M., and Swinney, J., Bovine Cartilage in Plastic Surgery. *Lancet* 235:389 (Sept.) 1947.

Zephiran solution batch, getting away from the proteolytic action of the mercurial and entering into the electrolytic theory of cellular reaction. The result was again the same. Discouraged by the results, the fourth implant came from the potassium mercuric iodide solution batch. Again the same reaction took place.

The bovine implants were removed and all of these patients have received and tolerated well preserved human cartilage. Bovine cartilage is no longer in the cartilage bank.

IVORY—While seldom used, this material is relatively well tolerated and may serve for many years. However, it is movable in its implant bed, and most likely will slowly work its way toward the skin to be extruded or demand surgical removal. Even multiple perforations to permit fibrous ingrowth are no permanent safeguard against misplacement. Almost invariably all patients who receive implants feel that the attachment to the bone should be solid and immovable.

TANTALUM AND VITALLIUM—These materials were used frequently in the correction of deformities incurred during World War II. As a temporary adjunct they are free from objections but as a permanent remedy these metals are not much better than ivory. In addition, they are far more expensive and far more difficult to handle. Workers using tantalum "wool" report promising results but only time will tell the extent of its usefulness.

PLASTICS, RESINS AND ACRYLICS—Several different compounds have been found and removed including ordinary dental modeling compound. One preparation, polyethylene, according to Rubin[6] and others, possesses all the desired qualities and none of the undesirable ones.

SOFT IMPLANT COMPOUNDS—These are mainly paraffin derivatives. Paraffin is not used much because it stimulates cell growth to an uncontrollable degree, resulting in all the destructive disfigurements of paraffinoma, a chronic granuloma which tends to become carcinogenic. Other cell proliferants, similar to those used in the injection treatment of hernia, are useful in filling small depressions, but cannot be used to create structural form and contour.

■ *The Protruding or "Strong" Chin*

The strong or protruding chin, with dental alignment developmentally normal or corrected to normal by orthodontic treatment, is seldom observed, but since it is occasionally presented for correction, the logical time to consider it at all is in sequence to its opposite condition.

A bony overgrowth or excrescence may be removed with saw, chisel, osteotome, rongeur or rasp, until a satisfactory reduction in size has been obtained. As a rule no attention is paid to the periosteum, either in preserving or removing it. The approach is usually through a transverse submental incision, which leaves the least amount of detectable scarring. Any soft tissue which appears redundant after the removal of excess bone, but is otherwise normal, is not re-

6. Rubin, L. R., and others. Polyethelene in Reconstructive Surgery. *Plast. & Reconstruct. Surg.* 3:586 (Sept.) 1948.

sected, but is allowed to shrink and recede spontaneously.

Reduction in size is easily attained, but whether it is an esthetic improvement is frequently debatable. Reduction necessarily blunts the point of the chin and bluntness may be more of a disfigurement than mere large size, particularly in women. To lessen the blunt effect in women, it is advisable to chisel out a median line groove into which the soft tissue recedes, thereby giving the effect of a dimpled chin. Soft tissue hypertrophy does not respond well to an indirect approach; it must be resected directly where it is most evident, irrespective of composition. The incision lines must be integrated with Langer lines to be as inconspicuous as possible.

■ *Mouth and Lip Deformities*

Mouth and lip deformities, which detract from an otherwise excellent orthodontic result of the type considered here, are more appropriately called "peculiarities" rather than deformities. As such, they vary greatly in their individual manifestation and importance both subjectively and in the opinion of the casual observer. Some of these peculiarities are noticeable with the face in repose and others only under the action of the muscles of expression, particularly upon smiling or laughing. If, when a person laughs, one sees an enormous display of gum surrounding a set of perfect teeth, the view may be startling, but not attractive. In effect, the good appearance of the teeth is detracted from, for we are all more prone to notice the unusual, the imperfect, rather than the perfect. This particular deformity or peculiarity can be described in terms of actual measurements. But measurements are in no way a guide to the extent of unhappiness which this peculiarity causes the individual.

The factor responsible for this deformity in the upper lip is an overaction of the risorius and levator labii muscles. Restricting their action by lessening the sulcus between lip and maxilla is a minor procedure, but of value only in very minor conditions and often only with temporary effect. Adequate correction demands actual severance of all the muscles involved. They are not resutured, the wound is permitted to heal by granulation. The resulting scar tissue growth very effectively limits the excess muscular action. In fact, adequate function may be so slow in reestablishing itself that much time may be spent worrying whether the operation has not caused permanent paralysis. During the recovery period the lip appears almost mask-like in its inaction; but so far no case has failed to recover adequately, though in one case it took six months before the smile was again considered natural.

Before resorting to any operative measures, it is necessary to prove that regulation of muscle action by suitable training does not accomplish the desired result. Too much control of the expression in smiling, however, is also apt to result in a smirk rather than a smile.

The lower lip likewise may reveal too much gum. If this is accompanied by a "weak chin," an enormous improvement in over-eversion may be expected from the chin correction. Two factors account for this: (1) in comparison, the weaker the chin is, the more the lower lip seems to protrude, and there is less apparent pro-

trusion when the chin has been made stronger; (2) the implant is placed between bone and muscle, thereby changing the fulcrum of muscular action.

There are quite a few other well-defined factors about the mouth subject to complaint and correction. They are of lesser importance only because they present themselves less frequently than the "weak chin" and the "gum smile." To the sufferer of these less frequently encountered conditions, however, his complaint is just as real and as vital as if it were of the more widely prevalent variety.

In considering a plan of corrective treatment it is obvious that each case must be studied individually. A study of the expression under different emotions is of more importance than solid structural form.

Emotional expressions of the face cannot be directly reproduced in plaster cast or any other form of moulage, for no action of facial expression can be maintained long enough to take an impression. Casts and moulages are, therefore, not of as much help as is the candid camera. With exposures no slower than 1/60 of a second, to stop all motion, and with the aperture at no wider than the F 5.6 lens opening to give sufficient depth of focus and sufficient distance to give an undistorted perspective (generally between three and six feet), a series of pictures can be obtained which register all emotions and which can then be studied at leisure. Supersensitive panchromatic film is the choice for the purpose of technical study; color film is of value in displaying the original condition and the final result.

Operative procedures employed in treating any of these conditions are of a minor nature and can be carried out under local anesthesia plus light sedation to avoid nervous tension.

There is practically no postoperative pain. Any discomfort is caused as much by the dressings as by the wound itself, or at least the patients report that they feel much better as soon as the dressings are removed. The dressings, however, are usually mere antiseptic coverings. In the case of chin operations their ability to keep implants in their proper place is quite open to debate, but their functional value in lessening the mobilization of the whole region during the first few days of healing is both advisable and unquestioned. Within three to four days dressings may be removed. Only under special individual circumstances is hospitalization advised. The treatment is, therefore, outpatient and ambulant. Intraoral operations obviously require no dressings, and immobilization is provided by nature, in the form of localized swelling, until healing is complete.

Typical examples of the two most common complaints referred to in this paper, namely, too much exposure of the gum and underdeveloped or "weak" chin, are reported here.

CASE 1—The patient was a 21 year old girl who was extremely self-conscious of her "weak" chin and the abnormal display of her gums when smiling. She considered herself the "ugly duckling" of the family, since her two sisters were considered to be beautiful girls. This comparison had caused her to become even more shy and unhappy. In an attempt to correct her deformities she had three years of orthodontic treatment which was very

Fig. 1.—The patient had had three years of othodontic treatment which was very satisfactory per se. However, external condition presented deformities; micrognathia or insufficient mandible; unsightly puckering of the skin of the chin; protrusion or eversion of lower lip; retracted columella causing additional shortness of upper lip; excessive elevation of upper lip on smiling; excessive visible gum on smiling

satisfactory from the functional viewpoint, but still left her deformities in great evidence (Fig. 1).

A one stage plastic operation was performed, in which the micrognathia was corrected by implantation of preserved cartilage to the chin in two sections. The levator labii superioris muscles were sectioned and stretched. The retracted columella was released at its base, obtaining in this manner an increase in its length and a slight decrease in its width, as well as aiding in lengthening the retracted and relatively short upper lip. The nasal tip

Fig. 2.—Appearance of patient after surgical correction in one stage operation as follows; implantation of preserved cartilage to chin in two sections; release and lengthening of columella; partial sectioning and stretching of levator labii superioris muscles; narrowing of nasal tip

Fig. 3.—Preoperative appearance of patient who had had eight years of orthodontic treatment at University Clinic for correction of malocclusion and for attempt to develop the chin. Malocclusion was corrected very satisfactorily but chin development was not obtained

was narrowed at the same time.

Figure 2 shows the postoperative appearance of the patient eight months after surgery.

CASE 2—An 18 year old boy was referred by his dentist with the recommendation that in order to complete the desired results partially obtained by orthodontics, his chin needed to be built up and forward and his nose made less prominent. The patient had just completed eight years of orthodontic treatment at the University Clinic for correction of malocclusion and in an attempt to develop the small chin. The malocclusion was

Fig. 4.—Corresponding postoperative views of same patient after implantation of cartilage to chin in a single section. The size and shape of the chin has been further enhanced by appropriate reduction in size of the nose

Fig. 5.—Appearance of patient five years after correction of underdeveloped chin by cartilage implantation and reduction in size of the nose

corrected very satisfactorily, but the chin development was not obtained (Fig. 3).

A one stage plastic operation was performed, by which the underdeveloped or "weak" chin was corrected by implantation of a single section of preserved cartilage. The nose was reduced in size and realigned to conform with the normal facial configuration, at the same time enhancing the size and shape of the chin.

Figure 4 shows the appearance of the patient 18 months after the operation. The photographs in Figure 5 are of the patient five years after surgical treatment.

■ *Summary*

1. Certain disfigurements, real or imaginary, are discussed which, because of their location around the mouth, are referred to the dental and oral surgeon for correction.

2. The most perfect and complete treatment of the underlying factors of jaw and teeth alignment often leaves disfigurements which are esthetic rather than functional, but which detract from the value of the dental surgeon's fine work, because, in the patient's mind, outward visible perfection is expected as well as internal functional excellence.

3. Treatment of such deformities by plastic surgery is presented for the most commonly encountered complaints. Detailed application surgical procedures varies with each case and demands careful individual study from the surgical as well as from the artistic viewpoint.

4. Such plastic surgical treatment can frequently add further value and satisfaction to an otherwise incompletely satisfactory orthodontic result, and for this reason close liaison and cooperation between the dental and the plastic surgeon are of vital importance for the benefit and gratification of patient and attending professional men as well.—727 *West Seventh Street.*

VOLUME 8 • APRIL 1950 • NUMBER 2

Osteoma of the mandible:
report of case

■ *Samuel A. Brandon, D.D.S., Portland, Ore.*

A white woman, aged 28, came to the dental college in June 1946 for examination. She stated that at the age of 9 she was struck on the left side of the face with a bat while playing ball. There was some swelling and pain. No treatment was given, and the symptoms gradually subsided. A few years later she noticed a small hard lump near the angle of the left mandible. It gradually became larger and harder. There was no history of anything similar in the family. The patient's parents were normal.

EXAMINATION—Clinical examination revealed an extremely hard protuberance below the angle of the left mandible about the size of half a walnut. There was no pain on palpation; nor had there been at any time during the history of the growth. The skin over the growth was taut, pulling the left side of the face out of shape.

A lateral roentgenogram revealed an extension of bone just anterior to the angle of the mandible on the left side (illustration, *A*). Apparently it was the same texture as the mandible. An occlusal view revealed a mass of bone the shape and size of half a walnut with a broad base attached to the inner surface of the mandible near the angle (illustration, *B*).

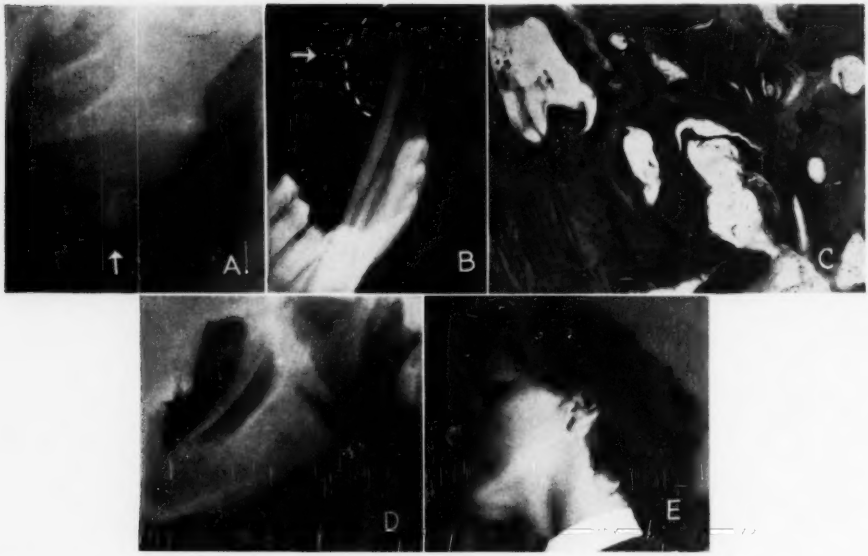
Physical examination revealed no abnormalities: blood pressure 120 systolic and 80 diastolic; pulse 84; respiration 18; heart negative; lungs clear. Blood examination revealed bleeding time three minutes; clotting time four minutes. Serology was negative; urine normal.

On June 18 the patient was given, and told to take before retiring, 1½ grains pentobarbital sodium. She was told to return to the clinic the following morning without breakfast. On June 19, at 8:30, the patient was given 1½ grains pentobarbital sodium, and at 9:15, 1/150 grain atropine sulfate. At 9:30 the patient was taken to the operating room and prepared for operation. The face and neck were washed thoroughly with green soap and water, followed by alcohol ether and tincture of Merthiolate. The patient was properly draped.

OPERATION—Under 2.5 per cent thiopental sodium anesthesia, a 1 inch incision was made about 2 cm. below the inferior border of the left mandible near the angle. With a periosteotome, the periosteum was peeled over the bony growth. The growth was excised with sharp chisels and a hand mallet. The wound was sprinkled with sulfanilamide crystals. The deep tissues were closed with one layer of 00 continuous catgut suture, and the skin was closed with silk.

COURSE—The patient was kept in the clinic until midafternoon, and was then taken home. Recovery was uneventful. She was examined periodically. The silk sutures were removed the fifth postoperative day.

PATHOLOGIC REPORT—The specimen consisted of a bony tumor from beneath the angle of the left mandible. It measured 2 by 1.5 cm.



A: Lateral roentgenogram showing bony growth on left side of mandible. B: Occlusal view revealed a mass of bone the shape and size of half a walnut attached to the inner surface of the mandible near the angle. C: Photomicrograph of specimen showing compact bone of normal structure. D: Lateral roentgenogram taken in June 1947, one year after operation, showing no regeneration and normal anatomy. E: Photograph of patient one year after operation. No scar is visible

The external surface, for the most part, was slightly irregular but smooth bone formation. The microscopic examination showed compact bone of normal structure. A small amount of marrow structure was present. No neoplasia was noted (illustration, *C*). Diagnosis was osteoma of the mandible.

FOLLOW-UP—The patient was examined in June 1947, a year after the operation. A lateral roentgenogram showed normal anatomy and no evidence of regeneration (illustration, *D*). There was no clinical evidence of regeneration and no visible scar (Illustration, *E*).—*620 Medical Dental Building.*

■ Loosening "Frozen" Glass Joints

When a piece of equipment has become rigidly frozen and resists all efforts to loosen it should be allowed to soak overnight in a solution of "Alconox." A gentle twist then will usually cause the equipment to easily come apart. It was found in many instances that glassware responded when subjected to "Alconox" only a few seconds.—*Eric D. Robinson, "Loosening 'Frozen' Glass Joints," Chemist Analyst, 36:70, 1947.*

Ameloblastoma of the mandible:

report of case

■ *Glenn J. Pell, D.D.S., Indianapolis*

On November 28, 1941, the patient, a white woman, aged 32, complained of sick headaches and pains in the back of the head and in the legs.

HISTORY—The patient had undergone an operation for the removal of a tumor in the mandible in the region of the right bicuspid and first molar twelve years before.

EXAMINATION—Examination of the mouth revealed a tumor mass in the vestibule near the bicuspid and the first molar region (Figs. 1, left, and 3, left). General physical findings were essentially negative.

TENTATIVE DIAGNOSIS—Ameloblastoma of the mandible.

OPERATION—The patient was hospitalized and was operated on under general anesthesia on December 1, 1941. The bicuspids and second molar were removed, a mucoperiosteal flap was retracted and the cystlike area was cleaned thoroughly. The tumor had produced several small holes through the lingual plate of bone. The outer plate of bone was very thin and was destroyed completely in places. The outer plate of bone was removed down to what appeared to be a good bone structure. About half of the mucoperiosteal flap was removed, converting the area into a semi-open cavity. The wound was dressed with petrolatum gauze.

PATHOLOGIST'S REPORT—Grossly, the specimen consisted of a number of fragments of tissue removed from the tumor of the jaw. These small irregular fragments of tissue, apparently cystic in character, were moderately firm in consistency and of yellowish color with irregular hemorrhagic staining on the surface.

Microscopic examination of a section taken through a fragment of this tissue showed it to have a general stroma of rather dense connective tissue in which were located cystic structures of small to large size which were lined by epithelium characterized by delimiting single layer formation of columnar cells immediately transformed into stratified arrangement of small dark staining cells without keratinization of the superficial layer. These were piled into 10 or 12 cell layers in depth and apparently surrounded cystic structures described above with branching, ramifying, girder-like separating strands between small cystic structures. The general stroma of the surrounding tissue was dense connective tissue with a minimal vascular supply and showed an overgrowth fibrous connective tissue with round cell diffuse infiltration.

PATHOLOGIC DIAGNOSIS—Adamantinoma of the mandible.

POSTOPERATIVE TREATMENT—The patient received two roentgenotherapy treatments after the operation. The dressings were changed at intervals until April 10, 1942, when the region was fairly well healed (Fig. 1, right). Figure 2, left, is a roentgenogram of the region taken one year after the operation. She was seen regularly at about three month intervals until in the early part of May, 1945, when an intraoral roentgenogram (Fig. 3, center) was taken.

Since there seemed to be a small area of recurrence, the area was opened, thoroughly cleaned, and dressings were instituted to allow it to regenerate slowly. Healing was uneventful. The patient has been seen at intervals until the present time and the bone and mucosa appear normal (Figs. 1, right and 3, right).

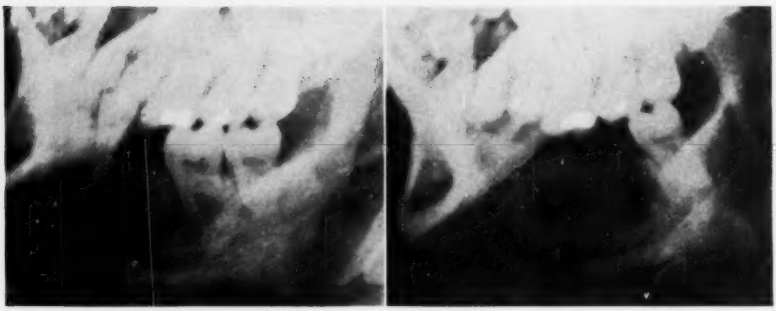


Fig. 1.—Roentgenogram showing involvement of the mandible associated with a tumor mass in the vestibule near the bicuspid and first molar region. Right: Postoperative appearance a short time after initial operation

PATHOLOGIST'S REPORT — The specimen consisted of two small, orange, wedge-shaped masses of gingival tissue. The second specimen consisted of a small, thin-walled, saclike structure approximately 8 mm. in diameter.

Microscopic study of the second specimen showed a well defined layer of connective tissue enclosing two open spaces. These open spaces were lined in some places with atypical cells epithelial in type. Some of these were polygonal and formed a layer two or three cells deep. In other instances, these cells tended to be columnar. In one area there was a small papillomatous growth. In another area was a larger structure the pattern of which was coarsely papillomatous. In this mass there was evidence of recent hemorrhage. It lay unattached in this plane. The remainder of these spaces was clear. In tissue of the walls surrounding these spaces there were several adamantoblastoma follicles. These varied considerably in size. Some of the larger ones developed secondary microcysts. Some of these contained eosinophilic hyaline material. The connective tissue stroma surrounding some of these follicles was very dense and collagenous, suggesting the gradual expansion

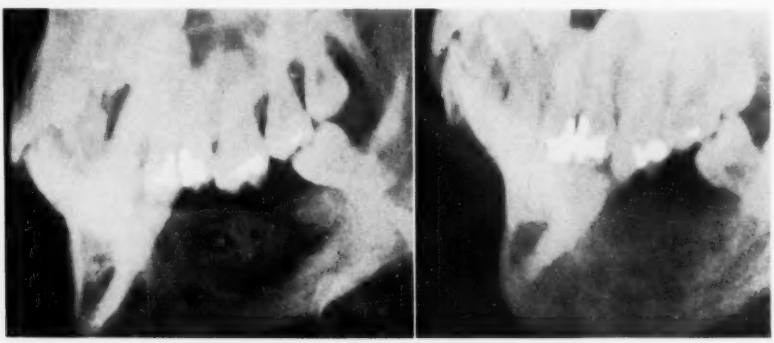


Fig. 2.—Extraoral roentgenograms. Left: One year after operation. Right: Six years after operation (January, 1947)

Fig. 3.—Intraoral roentgenograms. Left: Preoperative roentgenogram, showing tumor mass. Center: Small area of recurrence (May, 1945). Right: Six years after operation (January, 1947)

of the follicles. In no instance was there histologic evidence of tumor cells invading surrounding tissue in these sections.

Microscopic study of the first specimen showed gingival tissue. The squamous epithelium was intact. The underlying supporting tissue was stretched and dense, as if compressed by a gradually expanding lesion. There was nothing in the section indicating the nature of this lesion.

PATHOLOGIC DIAGNOSIS—Multicystic adamantoblastoma. This will recur if not entirely removed.

DIAGNOSIS—Ameloblastoma of the mandible. Since it appears that the tumor was a recurrence of the original tumor operated on twelve years before, there is a question as to whether it will recur.—505 *Hume Mansur Building.*

Aberrant maxillary cuspid with complications: *report of case*

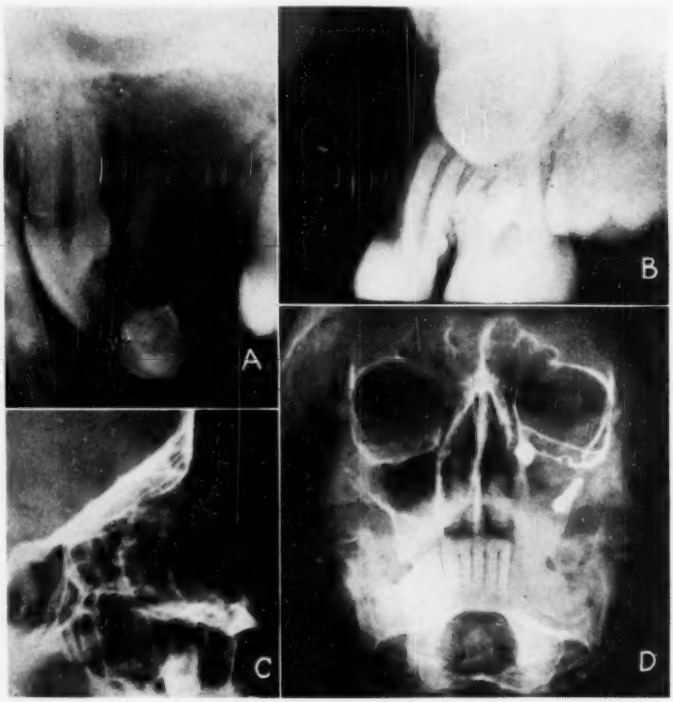
■ *W. Aubrey Crich, D.D.S., Grimsby Beach, Ontario, Canada*

On February 10, 1948, a 13 year old girl was referred to this office because of swelling high up in the right cheek, with an extraoral discharging sinus situated one-half inch below the inner canthus of the right eye. There was a small hard bony prominence palpable in this region. One week previously this patient had been hospitalized and given penicillin for treatment of an acute abscess. Examination revealed a small amount of thin yellow pus draining extraorally. Puslike fluid was draining into the mouth from the upper right cuspid region. The upper right lateral incisor, cuspid and first bicuspid teeth were missing. The upper right deciduous cuspid was still in position but was extremely loose. Five months previously this girl had come to Canada from Holland. She gave a history of intermittent swelling and drainage over a period of two years. Her doctor had "scraped" the bone on two occasions but no roentgenograms had ever been made. Physical examination was essentially negative.

ROENTGENOGRAPHIC EXAMINATION—Intraoral roentgenograms revealed a radiolucent region extending from the distal surface of the upper right central incisor to the mesial sur-

face of the second bicuspid (illustration, *A* and *B*). The lateral incisor and second bicuspid were unerupted. A tentative diagnosis of infected dentigerous cyst was made. An extraoral roentgenogram revealed the cuspid lying horizontally just below the floor of the orbit (illustration, *C*). There was a small amount of rarefaction about its crown and the tip appeared to be protruding through the labial plate of the maxilla. The first bicuspid was lying in the outer wall of the antrum (illustration, *D*). The right antrum showed increased density. This was believed to be due to thickening of the lining membrane, associated with a chronic inflammatory process.

OPERATION—On February 16 the patient was hospitalized and a regime of penicillin was instituted. Two days later, under intratracheal nitrous oxide-oxygen anesthesia, a wide exposure of the alveolar process was made, extending from the midline to the first molar region, by means of a mucoperiosteal flap. The labial plate of bone was almost destroyed in the lateral incisor, cuspid and first bicuspid regions. The cyst was opened and the lateral incisor and



A and B: Intraoral roentgenograms revealed a radiolucent region extending from the distal surface of the upper right central incisor to the second bicuspid. The lateral incisor and second bicuspid were unerupted. C: Extraoral roentgenogram revealed the cuspid lying horizontally below the floor of the orbit. D: The first bicuspid was lying in the outer wall of the antrum

first bicuspid were found and extracted. Enucleation of the cyst lining revealed the floor of the antrum to be completely destroyed and the maxillary sinus infected. The thickened antrum lining was removed. Examination of the ceiling of the antrum showed a tiny bit of the crown of the cuspid exposed. Enough bone was removed to expose the entire crown. The tooth was manipulated down into the antrum and removed. A nose and throat specialist made an antronasal window and inserted packing. The mucoperiosteal flap was replaced and sutured with catgut. A short drain of one-half inch iodoform gauze was placed in the cuspid region. Both drains were removed on the second postoperative day. The patient was given penicillin for another two days. Recovery was uneventful and she was dismissed on the fourth postoperative day.

CONCLUSION—This case reports multiple unerupted teeth with the maxillary cuspid being in an extremely high position, and shows the value of extraoral roentgenograms.

It also shows the necessity for cooperation between the rhinologist and the oral surgeon.

Radiation necrosis of the mandible: *report of case*

■ *Leonard Z. Lyon, D.D.S., Los Angeles*

A white man, aged 61, presented himself at the hospital February 16, 1940, with pain in the region of the lower anterior teeth. He also complained of considerable pain and tenderness in the lower lip extending down to the chin.

The patient stated that he was an inveterate cigaret smoker. His present trouble began approximately three years before with a lesion on the lower lip which had become progressively worse, until it became a large, ulcerated, cauliflower-like mass (Fig. 1, left). The lesion was removed in August, 1939. The patient received six treatments of roentgen therapy in September, 1939, which appeared to destroy the tumor (Fig. 1, right). Since that time he had received no treatment.

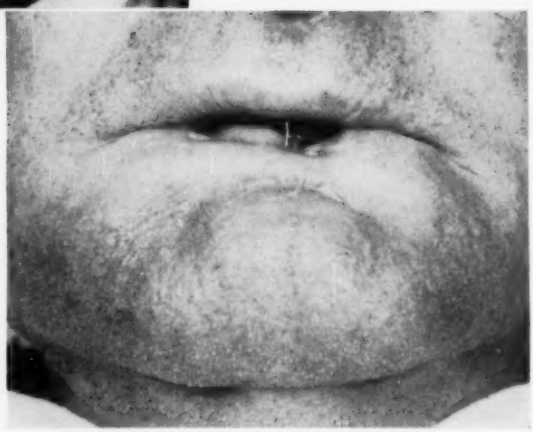
EXAMINATION—The patient was experiencing great pain. The lower lip could barely be retracted because of pain and fixation. The overlying skin of the chin and lower lip was red and inflammatory in character. The mucosal lining of the lower lip appeared atrophic and scarred, and revealed an extensive, rather deep ulceration which extended to the alveolar process of the lower incisor region. The alveolar bone was visible on the labial aspect of the remaining lower teeth. These teeth were loose and sensitive. The patient wore a full maxillary denture; oral hygiene was poor. There were two palpable, small, submaxillary lymph nodes, one on each side.

Roentgenograms disclosed advanced resorption of bone about the roots of the remaining lower teeth, which were on the verge of exfoliation (Fig. 2).

The patient was well-nourished and well-developed. His general physical condition was within normal limits except for the lymph nodes.

TREATMENT AND COURSE—It was decided to remove the remaining lower anterior teeth, because of the advanced alveolar resorption, in spite of the fact that there was evidence of radiation necrosis present in the region. These extractions were performed March 8, 1940 (six months after the roentgen therapy), under a

Fig. 1.—Left: Carcinoma of the lower lip. Picture taken in August 1939



Right: Appearance of the lip 11 months after initial surgery and roentgen therapy

bilateral mandibular nerve block of 2 per cent procaine. Shortly after the extractions the patient was relieved of pain.

The patient was seen weekly or semimonthly for the next six months. There was little apparent change in the involved region. The necrotic bone of the mandible from the lower right to left cuspid regions was exposed during this time.

September 13, 1940 (53 weeks after radiation therapy), there was swelling and pain, which was probably caused by secondary infection. The necrotic bone of the mandible was not separating. A biopsy section of soft tissue was removed from the lower right cuspid socket.

On September 18, 1940, an external incision was made for drainage of the abscess in the anterior submental area. A smear and culture were taken from the abscess. No malignant characteristics were noted. One Dakin tube was sutured in place to maintain drainage. The patient was seen each week; some external drainage continued. On November 19, 1940, a large sequestrum was removed from the mandible,

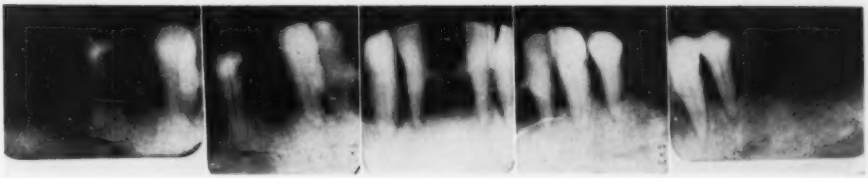


Fig. 2.—Roentgenograms of lower anterior and bicuspid regions, taken February 16, 1940

from the lower right to left bicuspid regions (Fig. 3).

On November 22, 1940, there was slight drainage from the lingual aspect of the lower right cuspid region. There appeared to be a small area of necrosis in the lower right first bicuspid region which was not loose.

The final spicule of the process was removed from the lower left lateral incisor region on January 28, 1941. There was no drainage and the region proceeded to heal.

The patient was seen every three months for the next year.

Approximately one year after the final operative procedure, February 3, 1942, the patient was again examined. There were no symptoms, the lower lip was soft and there were no palpable glands. He was instructed to return in six months, but failed to appear.

COMMENT—The extraction of the teeth did not appear to alter the course of the radiation necrosis. However, it is usually a better policy to extract all teeth regardless of their condition prior to the administration of roentgen or radium therapy for tumors of the jaw or adjacent regions if bone is to be irradiated in the course of the treatment.—3875 *Wilshire Boulevard.*

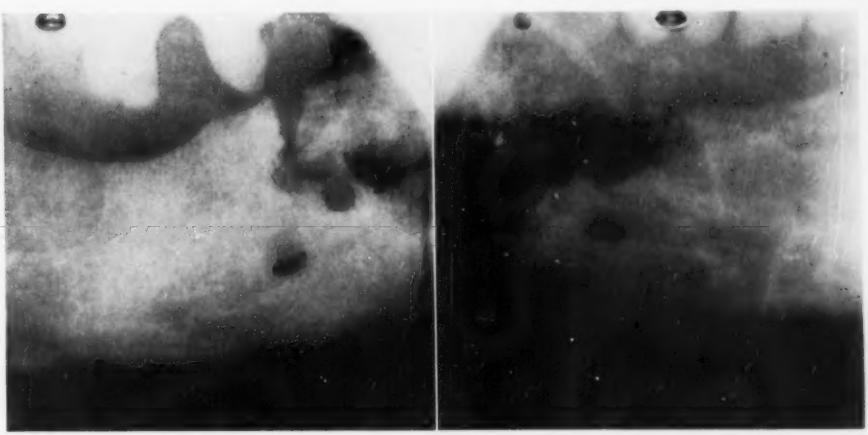


Fig. 3.—Roentgenograms showing sequestrum formation, taken November 19, 1940

Will oral surgery meet the challenge?

In his address before the Section on Laryngology, Otology and Rhinology at the ninety-eighth annual session of the American Medical Association, Atlantic City, on June 9, 1949, Dr. Henry B. Orton, chairman, spoke on "Some Trends in Otolaryngology" (*J.A.M.A.*, 141:749, November 12, 1949). He pointed out that with the advent of the era of the sulfonamide drugs, beginning in 1935, and followed later by the era of antibiotics, great changes have taken place in the specialty of otolaryngology. Many of the conditions formerly treated by this medical specialty have become infrequent or nonexistent. He stated that many leaders in the field of otolaryngology have emphasized the need for training of otolaryngologists for treatment of parts of the body contiguous with those which now concern them. He believes that otolaryngology has suffered from enchroachment, modifications, erosions and by directives from numerous sources including general surgeons, physicians, pediatricians, roentgenologists, plastic and maxillofacial surgeons, as well as psychiatrists. He indicates further that bronchoscopy, which has long been a recognized part of otolaryngology, is being taken over by the chest surgeon.

Dr. Orton stated that otolaryngology originally was an offshoot of medicine rather than surgery and that the present trend of encroachment upon the field of otolaryngology may stem from the fact that not too much effort has been made to train otolaryngologists in surgical principles. He believes that the otolaryngologists of the future must be thoroughly trained in the principles not only of surgery but of protein replacements and metabolism, fluid balance, treatment of shock, blood volume, preoperative and postoperative measures, systemic complicating factors, organic disease and physiologic considerations of thoracic surgery. He should also be familiar with thyroid surgery and metabolism, and the surgery of neoplasms of the head, neck and salivary glands. This author feels, and his opinions are shared by otolaryngologists at large, that otolaryngology should be reclassified into "surgery of the head and neck." This would expand the present

field to include the entire head and neck, including the thyroid gland, all malignant growths above the clavicle, diverticula of the cervical esophagus, resections of the neck, maxillofacial surgery and diseases of the mouth. Dr. Orton feels that a glowing future lies ahead of the otolaryngologists if they prepare themselves to include the above-mentioned anatomic fields.

The otolaryngologists as a whole have openly admitted the change in the type of otolaryngologic clinical practice during the past fifteen years. They also contend that they have been too busy solving many of the urgent problems within the limited field of the ear, nose and throat to deal with the problems in the immediate contiguous field which rightfully belonged to the specialty of otolaryngology. The time has now come when something should be done about this and they are beginning to expand the field on the basis of this philosophy.

It is true that there can be no monopoly on scientific knowledge. If the otolaryngologists can qualify themselves by virtue of training and experience to treat more skillfully diseases in the contiguous fields it will no doubt act as a stimulus to scientific progress and result in better service to the public.

Reports have come from various parts of the country, from general surgeons, chest surgeons, plastic and oral surgeons, that the otolaryngologists are overstepping their bounds and treating conditions which rightfully belong in other specialties. In spite of the fact that this trend is resented by the specialty being encroached upon, it must nevertheless be conceded that the otolaryngologists are making a legitimate, conscientious effort to prepare themselves to adequately care for pathologic conditions in the field immediately contiguous to the ear, nose and throat.

It is alleged that this encroachment has been extended into the field of oral and maxillofacial surgery. What can the specialty of oral surgery do to combat this trend? It is time that the leaders in this specialty take the time and make the effort to analyze the situation critically and, if necessary, take steps to remedy it.

In all probability the best remedy, and the one that will preserve oral surgery as a specialty, is to place in every medical center and hospital throughout the country more men who are better qualified by precept, practice and training to teach and to carry out the clinical practice in this specialty. The oral surgeons of America are in a rut. Unless they become alerted and overcome their present attitude of complacency they will find more serious encroachments upon their specialty. Although great progress has been made in the last twenty-five years in the field of oral surgery, there is still considerable room for improvement. The American Board of Oral Surgery has been created. It has set up certain exacting standards for training, by virtue of which young men to-

day may qualify for certification by the American Board of Oral Surgery. This is a noteworthy program, but of what value are these high standards unless adequate centers for training young men who wish to qualify can be provided.

It is the duty of all who pose under the dignity of the term "doctor" (which literally means teacher) to engage in some form of teaching, scientific investigation or organizational activity. It is true that some, by virtue of training and facilities, are better able to do this than others. It is true, however, that many men who have the qualifications and the physical setup to do this are so busily engaged in private enterprise that they cannot, or will not, take part in teaching, investigative or other scientific activities.

The annual meeting of the American Society of Oral Surgeons, which is intended to be a scientific session, is more social and political than scientific. The time allotted to the scientific sessions is too short and the group is too large to afford the best opportunity for teaching. The teaching value of this meeting could be enhanced considerably by giving outstanding teachers an opportunity to present their subject over a period of several hours or days to smaller groups. The subject matter of these sessions should be expanded to include the a''ed basic science problems as they relate to the clinical practice of oral surgery.

The size of the American Society of Oral Surgeons at this time should lend itself to the organization of interval sectional meetings in addition to the annual sessions. Sectional meetings might further provide facilities and opportunities for opening these meetings to all who are engaged in the special practice of oral surgery.

The home study courses in oral surgery that have been so well worked out at the University of Minnesota by the General Extension Division have not received adequate attention. Here is an opportunity for every oral surgeon to engage in an organized home study course specifically designed for the oral surgeon. Other specialties are taking advantage of courses of this type—why are not the oral surgeons doing it?

Another possibility for teaching and improvement in the field of oral surgery could be made possible by the organization of teaching clinics and short courses in the laboratories, hospitals and clinics of some of our larger teaching universities.

The organization of journal clubs and discussion groups would also afford the opportunity for advanced study and improvement. This possibility exists in any community where there are two or more oral surgeons.

Other specialties are conscious of the changes taking place in clinical practice and are doing something about it. What will the oral surgeons do?—*Reed O. Dingman.*

VOLUME 8 • APRIL 1950 • NUMBER 2 SURGICAL ORAL PATHOLOGY

Nevus of the gingiva

■ *Joseph L. Bernier, D.D.S., M.S., and Richard W. Tiecke, D.D.S., M.S., Washington, D. C.*

The term nevus is generally employed to designate a cellular lesion in which the cells give a positive reaction to dihydroxy phenolalanine. These lesions are common on skin; the face, neck and back are favorite sites. They may, however, be found on other areas of skin. These tumors are extremely rare intraorally in spite of the usual statement in textbooks that "they may occur anywhere in the oral cavity."

According to Thoma[1] the pigmented nevus may be congenital and may manifest itself either early or later in life. This, however, is not a universally accepted concept. Masson,[2] in 1926, wrote that he believed the nevus to be of neurogenous origin and Boyd,[3] in 1934, stated that if the nevus was pigmented it was intimately associated with nerve endings. Lunde and Stobbe[4] suggested that it originated in cells of the epidermis, a theory also favored by Karsner.[5]

In the nevus two types of cells are seen, the "clear cells" and the "nevus cells." It has been suggested that the nevus cells may be associated with the clear cells. However, it is more likely that they are destined to be chromatophores and are, therefore, of the histiocytic type, whereas the nevus cells are melanoblasts or pigment producing cells. The pigment produced is melanin which is believed to result from the activation of the chromatogenic factor (tyrosine, phenolalanine, tryptophane and sulfur) of the blood serum by the enzyme tyrosinase present in the melanoblasts. It is the pigment noted in the skin in Addison's disease and malaria.

The nevus cells are found clumped in the submucosa directly beneath the basal cell layer of epithelium and usually separated from it by a clear zone of dermis. This histologic type is considered as benign although it does have a malignant counterpart called "malignant melanoma." The so-called "junction nevus" or "dermal-epidermal" lesion in which the clear zone of dermis is absent and nevus cells appear in the epidermis carries a serious connotation. The benign nevus may, after repeated trauma, exhibit malignant change. The malignant melanoma is a highly vascular lesion which metastasizes early and widely.

Benign nevi occur in several forms such as the blue nevus and the freckle nevus; however, these are chiefly variations in the histologic pattern. In the more common cellular type the cells are arranged in sheets or nests lying in the upper corium but not in contact with the

Chief, Dental and Oral Pathology Section, Armed Forces Institute of Pathology, Washington, D. C. Executive Secretary and Pathologist, Registry of Oral Pathology of the American Dental Association.

Resident, Oral Pathology, Armed Forces Institute of Pathology, Washington, D. C.

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Fig. 1.—Low power photomicrograph shows the cluster of nevus cells completely filling in the upper submucosa and conforming to the outline of the epithelium which is somewhat thickened and shows parakeratosis

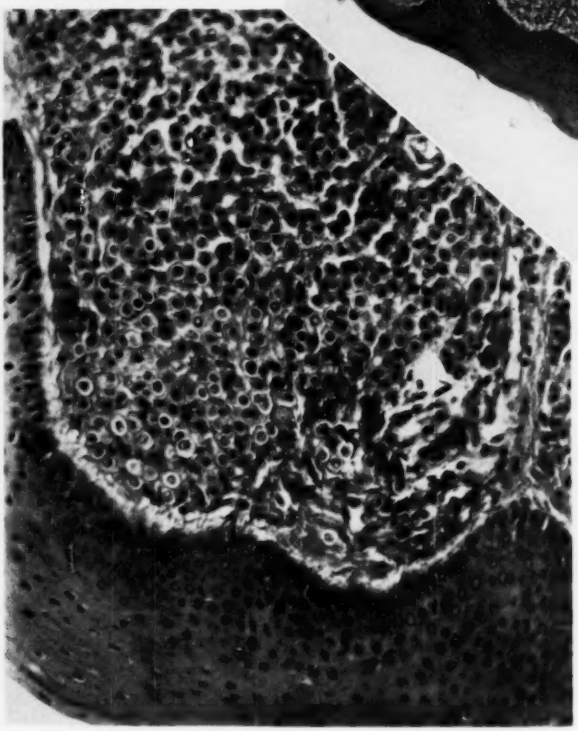

Fig. 2.—A higher power of Figure 1. Note the polygonal nevus cells with clear cytoplasm and dark nuclei. Here the clear zone between the nevus cells and the epithelium is distinct

epithelium. If nonpigmented its color is usually that of the surrounding tissue.

REPORT OF CASE—This patient, a 37 year old white male, first noticed a wart-like growth in the maxillary cuspid region about five weeks before admission for treatment. During that period it became progressively larger.

Upon examination a small nodular growth was noted on the labial gingiva firmly attached by a broad base to the underlying tissue.

TREATMENT—Under local anesthesia the entire lesion was removed by wide surgical excision and submitted for histologic analysis. Healing was uneventful. There is no follow-up data since this case has been under observation less than two months.

MICROSCOPIC—The covering mucosal epithelium exhibited some keratosis and the rete pegs were slightly elongated. Large collections of nevus cells were seen in the upper portion of the submucosa. They extended almost to the basal cell layer of the epithelium but were separated by a clear zone of dermis. The nevus cells were large, clear and polygonal with regular vesicular nuclei (Figs. 1 and 2). A number of cells had multiple nuclei and along the edges other cells were compressed. In these latter cells the nuclei appeared pyknotic. No pigment was present. The nevus cells did not extend deeply into the supporting tissue.

COMMENT—This is an example of a benign cellular nevus occurring intraorally. These lesions in this location are extremely rare and even though they have a counterpart in the malignant melanoma complete surgical removal is indicated. There is every reason to believe that this patient will progress to complete healing with no recurrence.

Mixed tumor of the parotid gland

■ *Joseph L. Bernier, D.D.S., M.S., and Richard W. Tiecke, D.D.S., M.S., Washington, D. C.*

The relative frequency of mixed tumors in the oral regions, where they constitute 1 to 2 per cent of all tumors seen,[1] makes them of more than passing interest to the general practitioner and of particular interest to the oral surgeon. During the past century a number of theories have been advanced as to their origin. Among the early postulates was that put forth by Conheim in 1882.[2] He described mixed tumors as arising from embryonic rudiments pinched off during development, and was supported in this belief by several other writers.[3, 4, 5] However, this theory never gained universal acceptance by the profession.

Mesenchymal tissue,[6, 7] ectodermal rests,[8] endothelium,[9] notochordal remnants[10] and epithelial elements of gland tissue[11, 12, 13] have

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been emphasized at various times as giving rise to the mixed tumor. This latter theory is the most widely accepted one at the present time, being supported by the work of Favata[13] and Allen.[14]

The age at which the tumors occur is extremely variable having been reported in children as well as adults. Cheyne and others[15] reported one in a child two weeks of age and Ahlbom,[16] at the other extreme, reported one in a patient 84 years of age. However, the average age of onset appears to be in middle life at approximately the third to fourth decades.[12, 15, 16]

Reports as to the duration of the tumor are widely divergent, one having been reported in one patient for as short a period as five months and in another for as long as 41 years.[15] In a series of 50 cases reviewed by Cheyne, Tiecke and Horne,[15] the average duration was 10.98 years.

The mixed tumor is slow-growing, exhibiting a tendency to recur. The exciting cause remains obscure although various factors, including trauma, have been given consideration. It is unlikely, however, that this factor should be considered significant. The tumor is usually painless unless traumatized, when secondary infection may become a factor, or until it attains considerable size.

A most serious feature of the mixed tumor is its tendency to recur which is undoubtedly due to the difficulty of complete removal. Although it is essentially a histologically benign lesion, occasional metastases have been reported.[17] It is believed by some workers that, since the chief cause of its recurrence is the difficulty of its removal, it should be classified as clinically malignant. This, however, is not in keeping with present day concepts of neoplasia.

Clausen and Henley[18] suggest that fear of injuring the seventh cranial nerve is the main reason for inadequate excision. They advocate radical removal with isolation and preservation of the facial nerve.

Trueblood[19] has stated that the capsule is compressed normal gland tissue and tumor cells may therefore extend into its substance. Recurrence is reported in about 25 per cent of the tumors in the literature. Stein and Geschickter[20] have reported the following data:

7 cases—treated with incision and cautery—100 per cent recurrence.
21 cases—treated with enucleation—57 per cent recurrence.
83 cases—treated with surgery including the removal of a cuff of normal tissue—13 per cent recurrence.

It has been stated that biopsy is contraindicated[21] in that the capsule may be ruptured and complete removal made more difficult; also that the tumor cells may escape into the surrounding tissue and further that once the tumore is disturbed it may grow more rapidly and develop local malignant changes.[18]

This, however, is questionable since, in the examination of hundreds of such biopsy specimens, these events have not occurred. Further, biopsy is essential to establish the correct diagnosis whatever may be the theoretic dangers.

In the past it was stated that these tumors are best left alone until they reach a consider-

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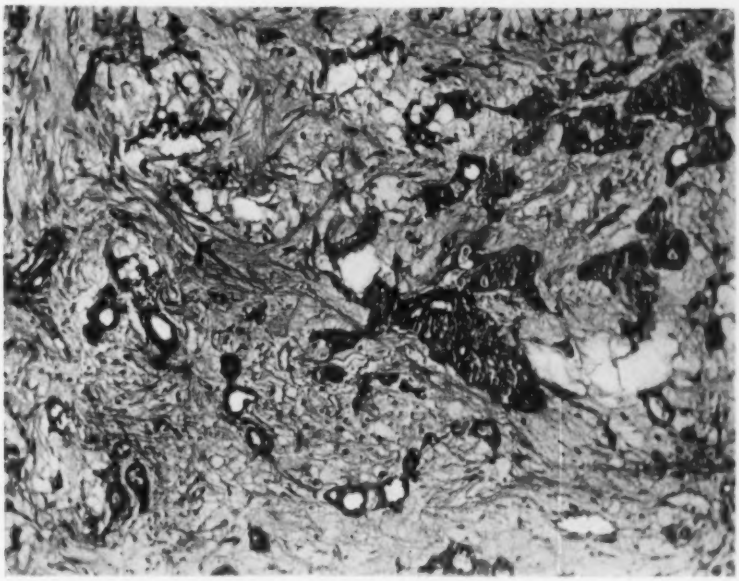

Fig. 1.—Myxomatous stroma with sheets and strands of epithelial cells. Some show cystic degeneration

able size. Present day concepts indicate that early removal, except in those patients with a short life expectancy, is the more desriable course to follow.[20] Since the mixed tumor is so-called because of a mixture of histologic elements rather than germ layers, its cellular pattern is extremely variable. These tumors arise in a stroma sensitive to the organizing influence of glandular epithelium and are not confined to the salivary glands. Because of this, the prefix "salivary" to the term "mixed tumor" has been abandoned.

REPORT OF CASE—A 55 year old white male was admitted to the hospital on March 28, 1949, complaining of a low back pain. At time of physical examination a small subcutaneous mass was noted just anterior to the angle of the left mandible in the preauricular region. This mass was slightly tender but not inflamed or swollen.

Biopsy was performed on April 7, 1949, and a diagnosis of mixed tumor of the parotid gland was made.

There was no previous history of a parotid tumor and the swelling had been present only six months.

TREATMENT AND COURSE—On April 13, 1949, the tumor was removed under gas oxygen ether anesthesia. One unit of whole blood was administered during the operation.

The postoperative course was good. The wound when dressed on the first postoperative day appeared to be healing normally. The sutures were removed on the third postoperative day, at which time the wound was somewhat tender and indurated. There was a slight elevation in temperature. The patient was given penicillin and heat was applied locally; these symptoms rapidly disappeared. There was a partial paralysis of the facial nerve but this also

Fig. 1.—Note the large vascular spaces partially filled with red blood cells. Also present throughout is salivary gland tissue. Smaller blood spaces are seen with the gland tissue itself

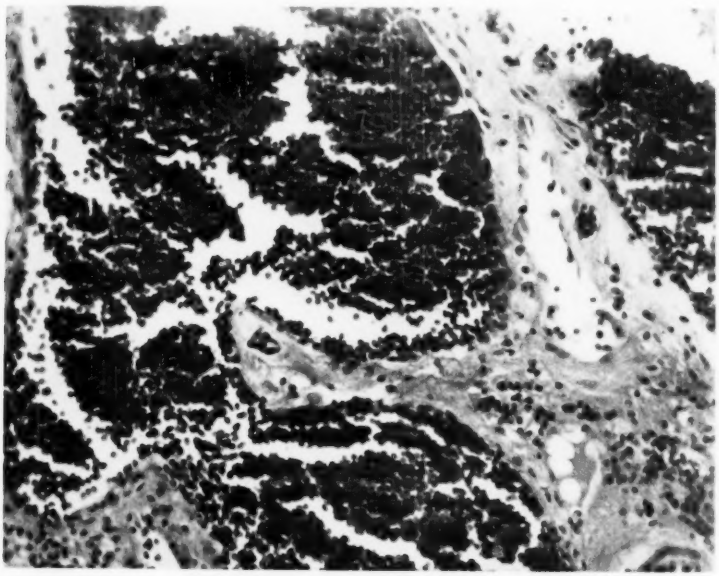

Fig. 2.—A higher power of the large blood space in Figure 1. The thin endothelial lining is seen. A smaller vascular channel is seen in the fibrous connective tissue septa and contains only a few red blood cells

TREATMENT—The patient was given 1½ grains pentobarbital sodium and 1/120 grain atropine sulfate, one-half hour prior to surgery. Under intratracheal anesthesia, a shallow incision was made extending from the region of the tragus of the left ear to slightly above the hair-line and down to the angle of the mandible. This was then carried down into the subcutaneous tissue until the temporal fascia was reached. The tumor was exposed and removed. Although the vessels were ligated there was considerable hemorrhage which was successfully controlled by thrombin packs.

The postoperative course was uneventful and, after initial slight pain and an elevation in temperature, the incision healed readily. The patient was given 300,000 units of penicillin daily for two days preceding the operation and for five days postoperatively.

MICROSCOPIC—The tumor was composed of many large dilated vessels which were engorged with red blood cells (Figs. 1 and 2). These vessels were located not only in the interstitial fibrous tissue, but also within the gland substance itself. Some were cavernous in character whereas others were of capillary size.

There was a marked increase in the amount of interlobular connective tissue which in some areas was infiltrated with lymphocytes, plasma cells and leukocytes. The connective tissue was collagenous, suggesting scarring.

In one area fat cells were seen separating the gland tissue into many small islets.

There was a considerable hemorrhage throughout the entire tissue undoubtedly referable to the operation. All of the blood spaces were lined with well developed endothelial cells many of which were actively proliferating.

■ PENICILLIN

Local injection of a solution containing approximately 33,000 units of penicillin per cubic centimeter is an effective and economical procedure in treatment of acute, circumscribed infections. The total amount of solution infiltrated into the affected regions varies, depending on the size of the lesion. Creation of undue tension within the tissue by injection of an excessive amount of solution should be avoided.—*I. W. Kaplan and R. McDonald, "The Local Injection of Penicillin in Acute Circumscribed Infections," New Orleans M. & S. J. 101:440, 1949.*

■ Sudden Blanching of the Cheek

Q.—In making a tuberosity injection, why is it that I frequently get blanching of the face in the infraorbital region?—*D.D.S., Colorado.*

A.—The sudden blanching of the cheek in the infraorbital region at the time a tuberosity injection is made is due to direct injection of the anesthetic solution into the internal maxillary artery or one of its branches. The anesthetic solution containing epinephrine is immediately carried to the skin capillaries by way of the infraorbital artery. The vasoconstriction, caused by the epinephrine in the arterioles, causes immediate blanching of the skin supplied by this vessel. This is a transitory phenomenon passing away in ten to fifteen minutes and probably not of great significance. This accident, however, should be avoided. The danger of injecting into arteries or veins in this region can be minimized by the use of a curved needle. The ordinary injection needle may be curved by passing it through a sterile gauze sponge held between the fingers, stroking the needle toward the bevel of the tip. A one-eighth circle curve on a needle will assure the passage of the tip of the needle close to the bony tuberosity, thus avoiding penetration of a vessel.

■ Anesthesia of the Maxillary Central Incisors

Q.—Why is it impossible in some cases to get anesthesia of the maxillary central incisors by the usual infiltration technics or by blocking of the anterior superior alveolar nerve?—*D.D.S., Georgia.*

A.—It is generally conceded by most students of the subject that the maxillary teeth get their nerve supply from the anterior superior alveolar nerve. It is a branch of the second division of the fifth nerve. In some cases it is not possible to get complete anesthesia of the maxillary anterior teeth by blocking this nerve or by infiltration technic about the apexes of the maxillary anterior teeth.

As pointed out by Dr. William A. Cook (The Nerve Supply to the Maxillary Incisors, *J.O.S.* 7:149, April, 1949), it is possible that the maxillary anterior teeth, in some cases, get part of their nerve supply from the nasopalatine nerve. Cook believes that branches are given off inside the nasopalatine canal to the maxillary anterior teeth. Ordinarily this nerve enervates a portion of the nasal cavity and the anterior portion of the mucosa covering the hard palate. He points out that in the bilateral cleft palate the nerve supply of necessity must come from the nasopalatine nerve. It is logical to assume then that in normal individuals this nerve might also contribute to the enervation of these teeth. In those cases where it is impossible to get anesthesia by the use of infiltration or blocking technics it is advisable to inject a few minims of anesthetic solution directly into the nasopalatine canal in order to block off the fibers which might possibly be passing from the nasopalatine nerve to the incisor teeth.

■ Accidental Opening of the Maxillary Sinus

Q.—If the maxillary sinus is accidentally opened during the course of the extraction of an upper bicuspid or molar tooth should the socket be packed to prevent infection?—*D.D.S., Texas.*

A.—The accidental opening of the maxillary sinus during the course of extraction is not a serious complication. In most of these cases the opening is at the apex of the tooth socket and practically all of them will heal spontaneously if a good blood clot can be established.

It is inadvisable to irrigate the maxillary sinus with any type of solution or to enter the sinus with instruments because of the possibility of introducing infection. If a portion of

the alveolar bone has been broken off during the extraction, exposing the floor of the sinus, it is advisable to close the opening immediately. This may be accomplished in some cases by further excision of the buccal and lingual alveolar bone which will permit approximation of the buccal and lingual gingival tissues by direct suture. In other cases it may be necessary to resort to palatal or buccal mucosal flaps to close the opening. The patient should be immediately advised about the complication and should be warned aginst blowing the nose because of the possibility of dislodging the clot or blowing air through the suture line. Nose drops to shrink the nasal mucosa and promote drainage through the antral ostium on the affected side should be used for a few days.

■ Diamond Bone Files Versus Steel Bone Files

Letter to the Editor.—In your answer to the relative efficiency of the diamond bone files and steel bone files in the Queries and Comments section of the October issue of the Journal of Oral Surgery, I find a vast disagreement in the results as observed in my practice.

Diamond bone files have a great deal of merit over the conventional steel files. I find that the diamond bone files, because they do not have large jagged teeth, remove bone with very little pressure and the effect is much less consequent trauma. In addition, because the diamond file will remove bone in any direction —in contradistinction to the steel file that removes bone only when drawn against the direction of the teeth—there is easier access and less tissue laceration. Another advantage of the diamond file that should be mentioned is that it retains its filing efficiency for a very long time. Unlike steel, diamonds do not lose their sharpness through boiling, through frequent usage and through being immersed in the blood medium for a long period of time.

I am sure that if you would make diligent observations of the diamond bone file versus the steel bone file you would arrive at the same conclusions.—*David L. Graitcer, D.D.S.*

■ Surgical and Maxillofacial Prosthesis. Oscar E. Beder. 51 pages, 31 illustrations. Price $3. New York: Columbia University Press, 1949.

This succinctly written handbook brings together for the first time all phases of that branch of dentistry which "attempts to protect or restore structures that are injured or lost by congenital or acquired means beyond the limits of normal prosthesis."

The author defines, discusses and lists materials and work that go into the making of splints, stents, protective shields in radiation therapy, obturators, appliances to correct resected or missing portions of the mandible, extraoral impressions, somatoprosthesis and cranial prosthesis. The technic of the construction of appliances, step by step, is also included.

Sixteen line illustrations and twenty-seven photographs serve to make this book even more valuable to students of dental surgery.

■ The Surgical Treatment of Facial Injuries. V. H. Kazanjian and J. M. Converse. 574 pages, 746 illustrations, 3 in color. Price $10. Baltimore: The Williams and Wilkins Company, 1949.

The authors have combined in this text their extensive personal experiences in the care of facial injuries. The general principles of surgical care of the various types of injuries are given emphasis with a liberal inclusion of individual cases well illustrated by photographs and operative diagrams. Numerous points of great practical value are noted to enhance the value of the book. No attempt is made to evaluate alternative methods of surgical treatment with which the authors have had no personal experience. The text is, therefore, a comprehensive record of their viewpoint and concepts in the subject and as such is a valuable contribution to the literature. Four pages of tables of contents are arranged for the convenience of the reader.

The first chapter is devoted to the growth of the face, comparative anatomy of the facial skeleton and the origin of the facial musculature. Included is an excellent section covering the applied surgical anatomy of the face.

Chapter 2, healing of wounds, is most informative including the histology and histopathology of wounds, skin grafts and scars. Many practical points on treatment are included.

The general principles of operative technic are covered in Chapter 3 in a most effective manner with many illustrations of methods of suturing.

Chapter 4, on the early treatment of facial injuries, covers the immediate life-saving measures for control of bleeding, asphyxia and shock. The classification of wounds of the soft tissues, the diagnosis of fractures, the technic of primary suture and delayed primary suture of facial wounds and the cardinal principles of treatment of maxillofacial wounds with loss of tissue are presented.

Chapter 5, fractures of the mandible, is a comprehensive discussion of all phases of the examination, diagnosis, healing and details of treatment of fractures of the lower jaw. The authors have drawn upon their extensive experience in presenting numerous aspects of their favored methods of treatment.

Chapter 6, fractures of the maxilla, likewise is a complete discussion of all aspects of fractures of the upper jaw and the authors' methods of treatment. Further discussion of fractures of the maxilla combined with fractures of the mandible, the nose and zygoma is presented in Chapter 9, complex fractures of the face.

Chapters 7 and 8 are outstanding discussions of fractures of the nose and zygoma respectively. The illustrations are most effective in providing the reader with practical details of numerous methods of treatment. The five chapters covering fractures of the facial bones are replete with illustrations to aid the surgeon in the care of such injuries.

Chapter 10, some general principles of reconstructive surgery, presents excellent and practical considerations in the diagnosis and choice of procedures in plastic surgery of the face.

Chapter 11, pedicled skin flaps, includes a fundamental discussion of the vascularization of the various types of local flaps—straight advancement, bipedicled advancement, transposition, rotation and Z-flaps. Numerous practical points are included in the text. A similar detailed discussion with excellent accompanying illustrations covers the subject of distant flaps which include direct distant flaps, tubed pedicled flaps, migration by intermediate transfer to the wrist, island artery flaps and complications.

Chapter 12 covers the subject of free grafts of skin and mucous membrane in a most complete and thorough manner. The discussion is fundamental. Numerous practical considerations are included. Free grafts of derma, fat, fascia, cartilage and bone are described in Chapter 13 in considerable detail including the technics of securing such grafts from the donor regions for transfer to the face. The advantages of the bone bank in surgery of the face are discussed.

Chapters 14 and 15 include the surgery of the scalp, forehead, eyelids and orbital region. Much valuable and practical information to guide the surgeon in the management of acute injuries and subsequent deformities of the upper face is presented with excellent illustrations and operative diagrams.

Chapter 16 covers the surgical treatment of a wide variety of traumatic nasal deformities in a most effective manner.

Deformities of the soft tissues of the lower portion of the face (Chapter 17) is a most informative section for the oral and maxillofacial surgeon. Illustrations and operative diagrams depict the extensive experience of the authors.

Chapter 18 covers the deformities of the bones of the lower portion of the face, including malocclusion of the teeth, loss of intermaxillary space and open bite retrusions resulting from fractures and infections. The multiple-stage procedures for restoration of soft tissues and subsequent bone grafting are explained in detail.

The oral surgeon will find much of practical value in Chapter 19, surgery of the oral cavity and pharynx. Surgical preparation of the mouth for dentures is presented in detail with ample operative drawings.

Chapter 20, on temporomandibular ankylosis, provides much valuable information on the diagnosis and treatment. Many worthwhile practical considerations are included in the text.

Chapters 21 and 22 cover the surgical treatment of facial paralysis and deformities of the external ear in an effective manner. Burns of the face are given lengthy consideration in Chapter 23, including primary and subsequent care, and the treatment of late burn deformities.

Chapter 24 covers maxillofacial prostheses, many of which are of interest and value to the oral surgeon.

The final chapter is a discussion of anesthetic management by Dr. E. A. Rovenstine.

The bibliography is appended and the index is adequate.

This comprehensive text on the surgical treatment of facial injuries is an outstanding addition to the literature, and it is recommended for oral, plastic, reconstructive and general surgeons called upon to treat such conditions.—*C. W. Waldron.*

■ How to Become a Doctor. George R. Moon. 131 pages, illustrated. Price $2. Philadelphia: The Blakiston Company, 1949.

Written to aid would-be doctors in planning their training, evaluating or improving their chances for entry into a professional school and the probabilities for success after graduation, this book brings within easy reach of every prospective doctor accurate inside information, the result of twenty years' experience. Much more than a catalog, it goes into a detailed discussion and analysis of the problems of finances, housing, outside employment, internships and residencies. This book covers the fields of medicine, dentistry, veterinary medicine, pharmacy, optometry, chiropody, occupational therapy, hospital administration, medical illustration and science.

■ Mandibular Bone Grafts. W. B. Macomber, R. A. Shepard and V. E. Crofut. Plast. & Reconstruct. Surg. 3:570, September, 1948.

In this article results were given of the treatment of 92 patients who had injuries of the mandible requiring bone grafts. A total of 106 bone grafts were required.

The early definitive care consisted of (1) institution and maintenance of adequate oral hygiene; (2) control of infection by chemotherapy and antibiotics; (3) conservative sequestrectomy and adequate drainage of suppurative processes; (4) extraction of roots or teeth when such were untenable for fixation or support, and (5) adequate immobilization and splinting. The latter was facilitated by cast screwlock type of splints in most cases. Trismus was reduced by exercising. The patients were put on a high caloric diet with vitamin therapy.

Prior to bone grafting procedures an adequate soft tissue bed was insured. In cases of severe loss of soft tissue the defect had to be filled by the shifting of flaps or by means of tubed pedicles to provide such a bed. A minimum of two months was allowed after such repair to permit satisfactory restoration of local circulation prior to bone grafting. A three month interval of recovery was insisted upon after the site was completely free from any suppurative process.

Four types of grafts were used in this series of cases: (1) osteoperiosteal, from the tibia; (2) iliac crest; (3) rib, and (4) tibial block. The first type was used only in the minimal bony defects or as "feeder" grafts where there had been failure of union or where there was resorption in a previously placed rib or iliac graft. The tibial block with an osteoperiosteal overlay was used in defects of moderate size. All larger defects were grafted with rib or iliac crest segments. The iliac grafts were not decorticated. The main disadvantage of the rib graft is the springiness when used to give continuity to the mandible.

The grafting operations were done under nitrous oxide-oxygen-ether with curare where it was necessary to gain complete muscular relaxation.

Adequate exposure of the operative site and preparation of the soft tissue to insure a vascular bed is essential. Emphasis was placed on the preparation of the bone ends to offer as large a contact area as possible for reception of the graft. Tantalum wire was used routinely to secure the grafts to their recipient abutments by passing the strands through holes drilled through the graft ends and their respective mandibular fragments.

Meticulous dissection technic was stressed to avoid perforation into the oral cavity. Hemostasis was a necessity in closure of the wound.

In the postoperative care, prophylactic penicillin and sulfadiazine were administered routinely for the first week. Fluid and electrolyte balance were maintained by the intravenous route until a high caloric liquid diet could be tolerated. The first dressings were done on the fourth or fifth postoperative day.

Further rehabilitation was accomplished by creating sufficient vestibular sulci and securing proper oral prosthetic reconstruction to restore functions of mastication and to improve facial contours.—*L. E. McKelvey.*

■ Complications and Sequelae of Untreated Fractures of the Facial Bones and Their Management. F. T. Moore, and I. G. Ward. Brit. J. Plastic Surg. 1:257, 1949.

The authors call attention to the fact that because of lack of training, incomplete examination, or lack of interest, facial fractures often are not recognized and not treated by the general surgeon. The rationalization that the plastic surgeon may correct these deformities later

if the patient desires also leads to delayed treatment in many cases. The authors stress that early treatment of these facial injuries is much more convenient and more effective for both the patient and the doctor than the treatment of malunion by refracture, reduction, bone grafts and other procedures. These injuries require the cooperative effort of the plastic, orthopedic, neurologic and ophthalmic surgeons from the beginning in order to obtain adequate results and avoid later extensive plastic procedures for correction. Fractures of the middle third of the face are especially serious inasmuch as they result in complications such as nasal obstruction, anosmia, diplopia, disturbance of the lacrimal apparatus, enophthalmos, injuries to the globe and optic nerve, injuries to the maxillary division of the fifth nerve and malocclusion. The authors recommend refracture and realignment of fragments in cases of malunion of facial fractures. Immobilization is important in the treatment of these fractures and is accomplished by means of a vertical rod in front of the face fixed to a plaster head cast at its upper end, and its lower end is fixed to a bar attached to cap splints on the upper and lower teeth. The movable fragment is then pinned with a wire bowstring from the cap splints to the vertical rod. Extensive comminuted fractures of the orbital floors and antral walls are immobilized by packing the antra with ribbon gauze. In one case this was left in place 37 days. The antra are approached through the Caldwell-Luc type incision.

■ Method of Making Tubes of Polyethylene Film for Use in Anastomosis of the Common Bile Duct, Trachea, and Pelvic Colon. J. H. Grindlay. Surgery 24:22, 1949.

Dr. Grindlay reports the use of a synthetic substance, polyethylene, for the construction of temporary ducts and tubes until nature can compensate by creating natural passages. Polyethylene is prepared by the polymerization of ethylene. The substance commercially is available in tubes, rods and flat film. It is semitransparent, pearl-gray in color and tasteless. The material has a "slippery" feel, it conducts heat poorly and is an excellent electric insulator. The material softens at temperatures above 110 C. and lends itself well to molding when heated. It is flexible and does not crack or break but is easily cut and has a high tensile strength and will hold a suture well. Polyethylene is chemically inert, and is not damaged by alkalies or acids. It causes very little inflammatory reaction in the tissues and does not react like most of the other well known foreign bodies.

Polyethylene film has been used to replace areas of dura or synovial membrane and has been used as a substitute for rubber and other types of plastic drains. It is employed to prevent adhesions of structures between stages of multiple-stage operations. It has been used for end-to-end anastomoses in the common bile ducts and the small intestines. The author reports its use in surgical procedures on the trachea and bronchus, colon and rectum with excellent results.

Variations in the use of this material will no doubt make it a valuable adjunct to the armamentarium in all branches of surgery.

■ Fundamentals in the Surgical Treatment of Mandibular Prognathism. Carl W. Waldron, Conrad I. Karleen and Charles A. Waldron. Plast. & Reconstruct. Surg. 4:163, March, 1949.

The authors feel that elective surgery of this type justifies a technic whereby the operator has an open view control of both proximal and distal fragments after division of the mandible. They do not believe the blind division of the ramus or condyle neck is the only solution to the problem. Emphasis is placed on the fact that no one method of surgical approach is indicated in all cases of prognathism.

Preoperative examination and records should include profile and full face photographs, a six foot direct profile and lateral jaw roentgenograms and alginate impressions of the maxillary and mandibular teeth from which casts are made of dental stone. The casts are mounted on an articulator in proper relation. Vertical marks are made on the teeth of the upper and lower casts. The lower cast is then

moved to the desired occlusion, and the indicated set-back measured and recorded for each side. Sections are removed from the plaster casts of the lower teeth to establish the desired occlusion. By replacing the anterior segment to its prognathic position the size and shape of the section of bone to be removed can be determined.

A thorough study of the casts and occlusal relationship is stressed, especially in the molar region. A prognathic patient with a full complement of teeth with good occlusion when the casts are fitted together should have a surgical division posterior to the second molar tooth, either a resection in the third molar-retromolar region or a ramus osteotomy, to prevent shortening of the dental arch.

Emphasis is placed on careful study of the maxilla with the patient's future occlusion and efficient mastication in mind. If the maxilla is in a retruded position, with a reasonably full complement of teeth, the mandible should be set back to the best possible occlusion even if a subsequent bone or cartilage graft is necessary to give normal prominence to the chin. A partially or completely edentulous maxilla in a retarded position with associated mandibular prognathism presents a combined surgical and dental prosthetic problem. The site of operation is determined by the length of the alveolar process of the mandible, denture clearance space between the tuberosity and the ramus, the position of the angle and the individual preference of the surgeon.

The adult patient with cleft lip and palate may present a deformed, retruded and immature maxilla along with prognathism of the mandible. Much can be accomplished by setting the mandible back part way and constructing a dental restoration (usually an over-denture) which will function fairly well, support the lip and look well.

Open bite malocclusion with a slight or a considerable degree of prognathism presents the greatest problem. These cases are handled by a well planned division of the body of the mandible with resection of a predetermined V shaped or Y excision of bone. In open bite deformity with pronounced prognathism, a careful evaluation of the dental casts should determine whether removal of (1) sections of bone in the bicuspid-molar region or (2) bone behind the molars or (3) an oblique osteotomy of the ramus is the method most likely to produce the best results.

The authors feel that the proponents of resection of bone in the bicuspid-molar region have overemphasized the complications after a ramus osteotomy which can be reduced to a minimum by careful preoperative study and postoperative care.—*W. C. Moorman.*

■ A New Drug in the Treatment of Radiation Sickness. John W. Beeler, Jan H. Tillisch and Walter C. Popp. Proc. Staff Meet., Mayo Clin. P. 477, September 14, 1949.

Radiation sickness is a common disturbing complication of prolonged periods of irradiation for treatment of neoplasms. Beeler, Tillisch and Popp, of the Mayo Clinic, were impressed with the similarity of irradiation sickness to that of sea sickness and motion sickness. It occurred to them that Dramamine, which has been very useful in the treatment and prevention of sea sickness and motion sickness, might be of value in the treatment of irradiation sickness. These authors report on a series of 82 patients, with moderate or severe degrees of irradiation sickness, and they find Dramamine can be safely used as a therapeutic and prophylactic agent in the treatment of irradiation sickness. They find that Dramamine and Pyridoxine in more severe cases give an excellent means of control.

The pharmacological action of Dramamine is not known but it is thought that it might have a depressing action on the vomiting reflex. It also brings relief of the other postirradiation symptoms, malaise, prostration and lethargy, which are believed to be secondary to the vomiting reflex.

The best results were found by giving 100 mg. of Dramamine one hour before irradiation, repeating an hour and a half later and again in three hours, making a total of 300 mg. In cases where nausea and vomiting were severe the same dosage in combination with 200 mg. of Pyridoxine intravenously gave better results than either drug used alone.

Announcements

■ The American Board of Oral Pathology

The American Board of Oral Pathology will conduct its next examination at Atlantic City, New Jersey, in conjunction with the 1950 meeting of the American Dental Association. The exact date, time and place will be announced at a later date. The examination will be both practical and oral. Individuals who contemplate appearing before the board should make arrangements to submit their credentials as soon as possible.

Prospective candidates may secure detailed information by addressing the secretary, Lt. Colonel Joseph L. Bernier, D. C., Armed Forces Institute of Pathology, Seventh Street and Independence Avenue, S.W., Washington 25, D. C.

■ American Board of Oral Surgery

The next examination of the American Board of Oral Surgery will be held in Chicago, April 2 and 3, 1950. For information write Dr. Leslie M. FitzGerald, Secretary, 718 Roshek Building, Dubuque, Iowa.

■ First Annual Berkshire Conference in Periodontology and Oral Pathology

Tufts College Dental School Postgraduate Division will conduct an advanced conference in periodontology and oral pathology under the direction of Dr. Irving Glickman and staff, at Eastover, a resort hotel in Lenox, Massachusetts, June 13 to 17, 1950. The conference will consist of four days of lectures, seminars and panel discussions regarding clinical problems by outstanding teachers and clinicians in dentistry, medicine and their related fields.

The curriculum is arranged so that only the mornings and evenings are devoted to professional activities.

For information concerning costs and for application and reservation forms write to The Berkshire Conference, Tufts College Dental School, 136 Harrison Avenue, Boston, Massachusetts.

■ Relief Fund of the American Dental Association

The Council on Relief announces that contributions to the 1949 American Dental Association Relief Fund may still be made. Members who have neglected to participate in the current campaign are urged to do so now. Those who have participated may wish to contribute an additional sum. Receipts thus far amount to but 60 per cent of the anticipated goal of $100,000; insufficient to provide for the needs of members now on the American Dental Association relief roll. Please forward your contribution to American Dental Association Relief Fund, 222 East Superior Street, Chicago 11, Illinois.

■ Meeting of American Association for Cleft Palate Rehabilitation

The annual business and professional meeting of the American Association for Cleft Palate Rehabilitation will be held April 28 and 29, in the LaSalle Hotel, Chicago. The Professional Colleges of the University of Illinois and Northwestern University will be co-hosts to the Association. The professional meetings will be held on the campuses of the host universities. The program will consist of technical and professional papers and discussions.

Hotel and program information may be obtained by writing to Dr. Herbert Koepp Baker, Speech and Hearing Clinic, 904 West Adams Street, Chicago 7, Illinois.

Persons interested in the field of cleft palate rehabilitation are invited to attend. The convention fee is $3 for persons who are not members of the American Association for Cleft Palate Rehabilitation. Students will be admitted without payment of the registration fee upon presentation of their university or college matriculation cards or acceptable certification.

■ One Week Course in Minor Oral Surgery

The University of Toronto Department of Oral Surgery will offer a course for one week in minor oral surgery from April 17 to 21. For further information address Dr. J. H. Johnson, University of Toronto, School of Dentistry, 230 College Street, Toronto 2-B, Canada.

■ American Society of Oral Surgeons

The thirty-second annual meeting of the American Society of Oral Surgeons will be held at the Hotel Ritz-Carlton in Atlantic City, October 25-28, 1950. For further information write Dr. Harry Bear, Secretary, 1112 East Clay Street, Richmond 19, Virginia.

■ American Association of Industrial Dentists

The annual convention of the American Association of Industrial Dentists will be held at the Hotel Sherman, Chicago, April 25, 26 and 27, 1950. There will be papers, conferences and discussions about dental health programs in industry, and physicians and dentists in industries with comprehensive industrial dental services will participate in the program.

A tour of an industrial plant having a dental installation is scheduled. All ethical dentists engaged in or interested in industrial dentistry are welcome.

■ Fellowship in Oral Pathology

Lt. Colonel Joseph L. Bernier announces the availability of a Fellowship in Oral Pathology at the Armed Forces Institute of Pathology. The Fellowship is sponsored by the American Dental Association as one of the activities of its Council on Dental Museum and Registry. The Fellowship may be filled at any time and is initially for a one year period from time of appointment. Renewal for a subsequent year is possible. The training received is creditable toward the American Board of Oral Pathology.

For further information write Lt. Colonel Joseph L. Bernier, Armed Forces Institute of Pathology, Seventh Street and Independence Avenue, S.W., Washington 25, D. C.

■ Two Year Internship in Oral Surgery

A two year internship is offered in the field of Oral Surgery at the Geisinger Memorial Hospital, Danville, Pennsylvania. The service begins July 1, 1950. The Department of Oral Surgery is under the direction of Dr. James B. Smith.

Editorial communications

■ ORIGINAL COMMUNICATIONS—This journal invites concise original contributions in the broad field of clinical and experimental surgery of the mouth and associated structures, including roentgenology, diagnosis, anesthesia and oral surgical pathology. Articles are accepted for publication with the understanding that they are contributed solely to the JOURNAL OF ORAL SURGERY. All manuscripts are subject to editorial modification. Neither the editors nor the publishers accept responsibility for the views and statements of authors expressed in their communications.

■ MANUSCRIPTS—Manuscripts submitted for publication should be sent to Reed O. Dingman, Editor, 221 North Ingalls Street, Ann Arbor, Michigan.

Manuscripts should be typewritten on one side of the paper only, with double spacing and liberal margins. The author's name and the abbreviated title of the article should appear at the top of each manuscript page. The original should be sent to the editor and a carbon copy retained by the author.

References should be placed at the end of the article and should conform to the style of the Quarterly Cumulative Index Medicus; viz., name of author, title of article and name of periodical with volume, pages, month and year. They should be numbered and should appear in the same order as that of the superior figures inserted in the appropriate positions in the text.

■ ILLUSTRATIONS—Illustrations accompanying manuscripts should be numbered and the author's name should appear on the margin or back.

Authors should insert figure numbers at appropriate places in the text. The original drawings, not photographs of them, should accompany the manuscript. Legends for illustrations are to be typewritten in a separate list with numbers corresponding to those on the photographs and drawings.

A reasonable number of halftone illustrations will be reproduced free of cost to the author, but special arrangements must be made with the editors for color plates, elaborate tables or extra illustrations. Copy for zinc cuts (such as pen drawings and charts) should be drawn and lettered in India ink or with black typewriter ribbon (carbon paper placed with carbon against back of sheet for bolder type). Ordinary blue or colors will not reproduce. Only good photographic prints or drawings should be supplied for halftone work.

■ CASE REPORTS—Case reports will constitute an important department of the journal and the editors welcome case reports that are of unusual clinical value or that present exceptional conditions of interest to dental surgeons.

■ EXCHANGES—Letters, exchanges, reprints and all other communications relating to the JOURNAL OF ORAL SURGERY should be sent to the American Dental Association, 222 East Superior Street, Chicago 11.

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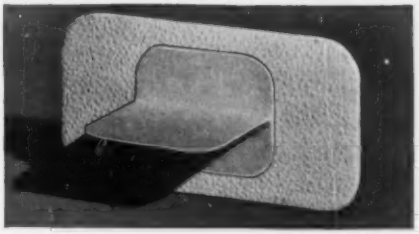

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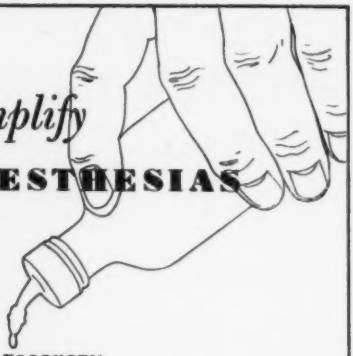

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By Varaztad Hovhannes Kazanjian, M.D., D.M.D.
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and John Marquis Converse, M.D.
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